State of California
The Resources Agency
Department of Fish and Game

RECOVERY STRATEGY FOR CALIFORNIA COHO SALMON

Report to the California Fish and Game Commission

Prepared by
The California Department of Fish and Game

Species Recovery Plan Report 2003-1

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7 Watershed Recommendations

Range-wide recommendations for recovering coho salmon in California are presented in Chapter 6. While some issues and risks facing coho salmon are constant across the entire range, others are unique to an ESU. Additionally, issues and risks for coho salmon populations and their associated habitat (both current and historic) vary substantially by watershed. Accordingly, the coho salmon recovery strategy emphasizes recovery recommendations and activities at various hydrologic levels within each ESU.

7.1 WATERSHED CLASSIFICATION

To provide consistency with existing resource databases, these recovery recommendations were compiled according to the geographic divisions of the CALWATER 2.2a system; the standard watershed mapping system used by the State of California (Appendix E). The CALWATER classification system includes (from largest to smallest) hydrologic regions, hydrologic units, hydrologic areas, hydrologic sub-areas, and planning watersheds. For purposes of this plan, issues and recommendations are primarily organized by two geographic levels, the *hydrologic unit (HU)*, which generally corresponds to major watersheds or sub-regions within the range of coho salmon, and within each HU by *hydrologic subarea (HSA)*, which generally corresponds to major tributary watersheds. In a few cases recommendations are presented for the *hydrologic area* (HA), a unit intermeidate in scale between the HU and the HSA. In some cases where adjacent HUs have similar characteristics and issues they are presented in a combined section (e.g., Bodega HU and Marin Coastal HU, multiple HUs tributary to San Francisco Bay).

The SONCC ESU has been divided into twelve watersheds (i.e., Hydrologic Units) and the CCC ESU into six (Table 7-1). HU boundaries within the range of coho salmon are illustrated in Figure 7-1. Each ESU and corresponding watersheds are discussed briefly below. The priority[1] for each HSA is provided as part of that discussion. Each watershed description is followed by several recommendations. These recommendations are at the most specific hydrologic delineation possible that could be supported by existing information.

[1] Prioritization is described in Section 10.1.

TABLE 7-1: Watersheds in the SONCC and CCC ESUs

SONCC	CCC
Rogue River HU and Winchuck River HU	Mendocino Coast HU
Smith River HU	Russian River HU
Klamath River HU	Bodega and Marin Coastal HUs
Salmon River HA	San Francisco Bay HUs
Shasta Valley HA and Scott River HA	San Mateo Coastal HU
Trinity River HU	Big Basin HU
Mad River HU	
Redwood Creek HU	
Trinidad Plain HU	
Eureka Plain HU	
Eel River HU	
Cape Mendocino HU	

7.2 SOUTHERN OREGON/NORTHERN CALIFORNIA COASTS ESU

The Department's status review (CDFG 2002) concluded that state Threatened listing of the California portion of the SONCC coho salmon ESU was warranted. Recent survey data show a substantial reduction in the number of streams occupied by coho salmon compared to their historical distribution, although the decline in coho salmon distribution in this ESU appears to have stabilized since the mid 1980's. However, because of the decline in distribution prior to the 1980s, the possibility of a severe reduction in distribution as indicated by field surveys and the downward trend of most abundance indicators, the Department concluded that coho salmon populations in California portion of this ESU will likely become endangered in the foreseeable future in the absence of the protection and management required by CESA. The Department, in consultation with CRT and SSRT, has identified the following protection and management actions to reverse the decline of coho salmon.

7.2.1 ROGUE RIVER AND WINCHUCK RIVER HYDROLOGIC UNITS

These two HUs are located mostly in Oregon. Portions of the Illinois River, a tributary to the Rogue River (Figure 7-2), and the Winchuck River (Figure 7-3) are located in California.

FIGURE 7-1: Hydrologic units in California within the SONCC and CCC ESUs

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FIGURE 7-2: Rogue River and Klamath River Hydrologic Units

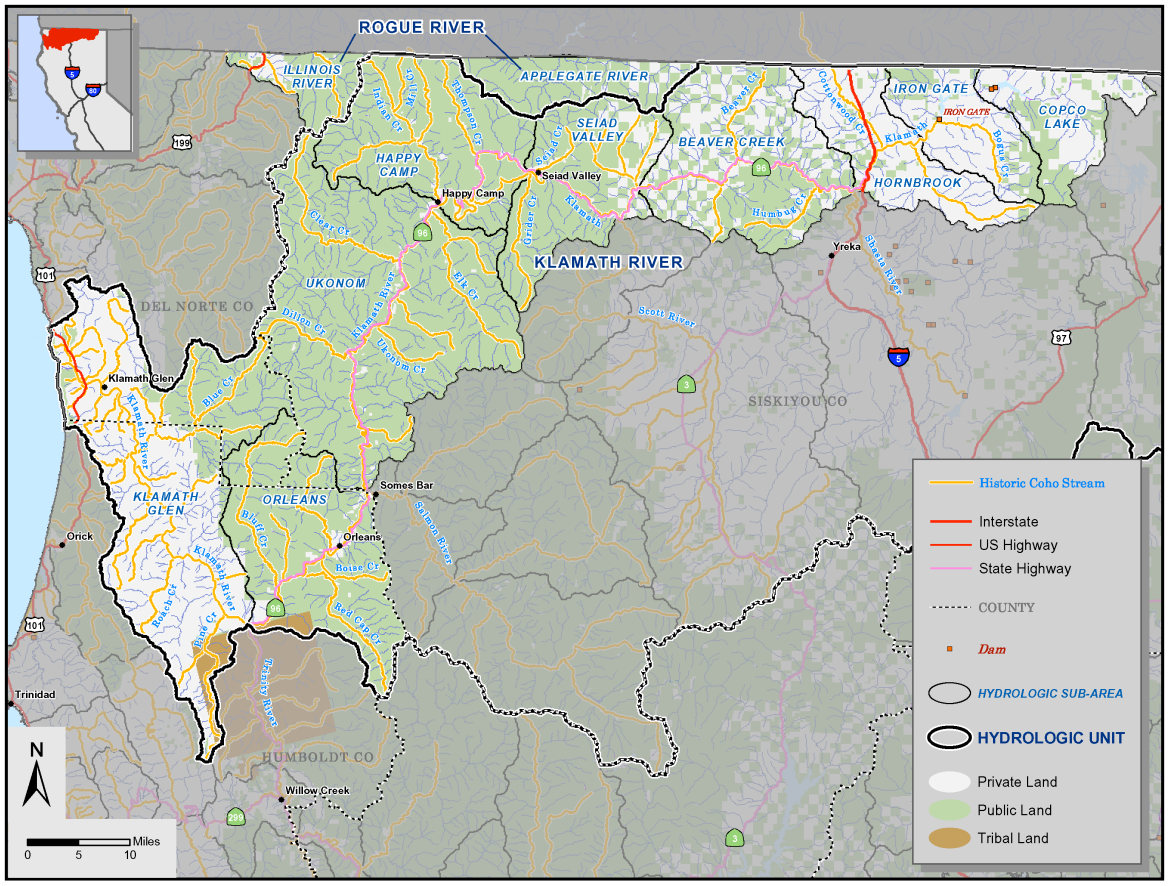

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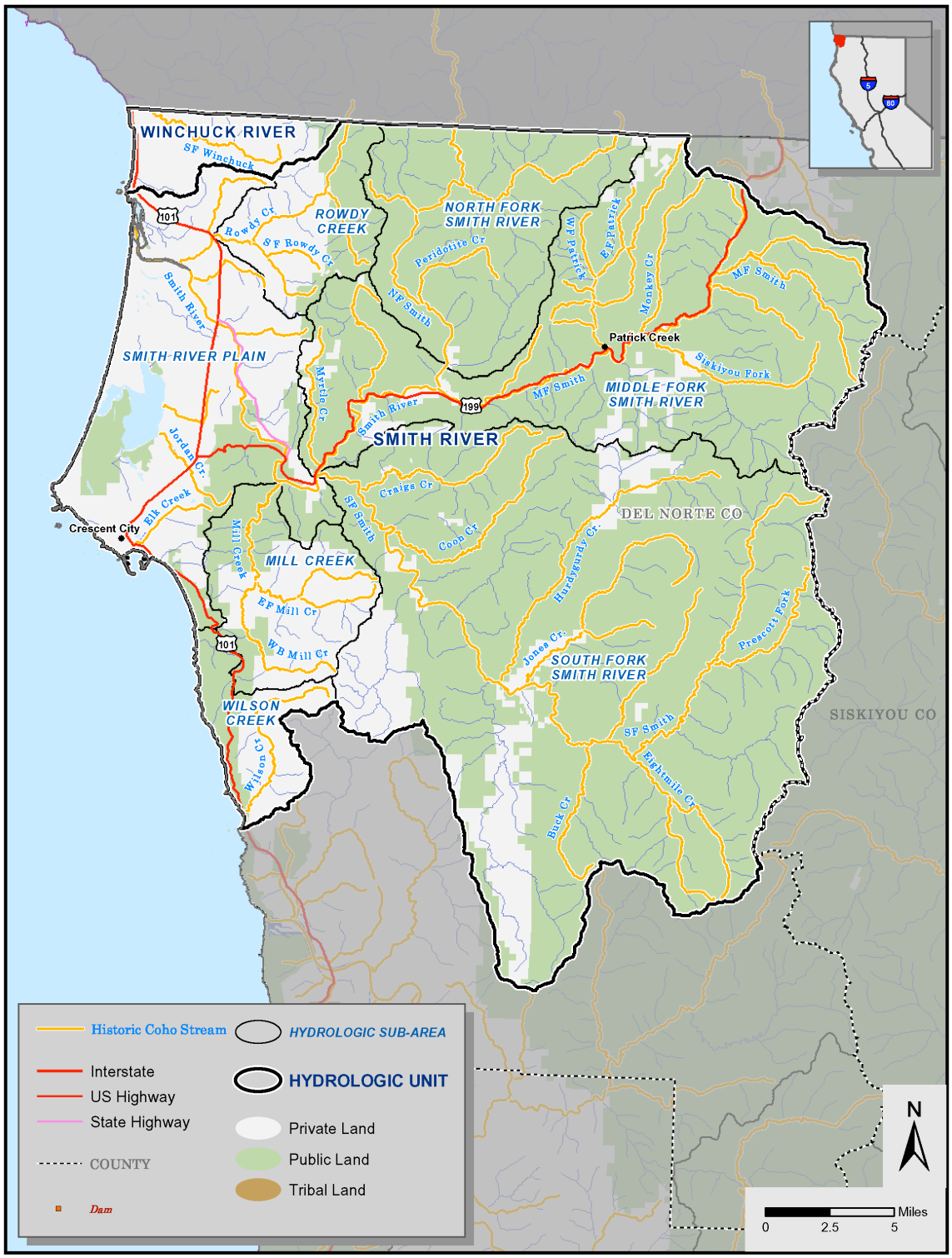
FIGURE 7-3: Winchuck River and Smith River Hydrologic Units



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7.2.1.1 Illinois River HSA (Priority Map Values: 5-3-4-5)

A very small portion of the Illinois River HSA is located in eastern Del Norte County, California. The main drainages of the Illinois River HSA in California are Elk Creek, the East Fork Illinois River, and Dunn Creek. Portions of these drainages are in the Siskiyou National Forest, and the rest is in private ownership. Timber production is among the main land use activities. Coho salmon have been found in the above-listed drainages as well as a few of their main tributaries in recent Department surveys. Problems for coho salmon recovery in these drainages include inadequate pool structure due to insufficient existing and recruitable conifer LWD and excessive fine sediment.

Recommendations for the Illinois River HSA are:

RO-IR-01 Develop a long-term plan to promote retention of LWD.

RO-IR-02 Support continued control of sediment.

RO-IR-03 Monitor impacts of suction dredge activities.

RO-IR-04 Develop a cooperative management strategy with Oregon Dept. Fish and Wildlife to improve downstream habitat conditions.

7.2.1.2 Winchuck River Hydrologic Unit / Winchuck River HSA (Priority Map Values: 5-5-5-5)

The South Fork Winchuck River is the only portion of the Winchuck River HSA located in California. The primary land use in the South Fork drainage is industrial timber production. Coho salmon have been found in the South Fork in recent Department surveys. Potential problems for coho salmon recovery in this river include inadequate pool structure due to insufficient existing and recruitable conifer LWD and excessive fine sediment.

Recommendations for the South Fork Winchuck River are:

WR-SF-01 Develop a short-term plan to increase LWD until natural recruitment can be restored.

WR-SF-02 Develop a long-term plan to restore a mature coniferous riparian zone to South Fork Winchuck River.

WR-SF-03 Support the assessment, prioritization, and treatment of sources of sediment.

7.2.2 SMITH RIVER HYDROLOGIC UNIT

The Smith River (Figure 7-3) is California's fourth largest coastal river, with a watershed of approximately 390,400 acres (610 mi^2) in California, and 73,600 acres (115 mi^2) in Oregon. At its terminus, the Smith River flows through an agriculturally developed coastal plain, and enters the Pacific Ocean four miles south of the Oregon border. The mainstem Smith River is fed by three forks, the North, South, and Middle. The Smith River estuary is an important rearing habitat for juvenile salmonids. The precipitous upper canyon areas are forested in fir, spruce, cedar, and pine with groves of tall redwoods in Redwood National and State Parks. Second and third growth trees, most often planted after harvest, inhabit the majority of merchantable timberlands in the basin. A large portion of the Smith River watershed supports a unique flora, which exists on unusual soils derived from ultramafic parent materials.

The main industries in the basin today are timber production, agriculture, sport fishing, gravel extraction, tourism, and other recreational activities. Agricultural industries within the basin include lily and flower production, beef and dairy ranching and some hay production. The majority of agricultural activities in the Smith River basin occur on the Smith River Plain along the lower seven miles of the river. Aggregate extraction in the Smith River basin occurs near the mouth of Sultan Creek downriver to the Reservation Ranch Bar.

Historically, salmon were very abundant in the rivers and streams of the Pacific Northwest and the Smith River was no exception. In the late 19th and early years of the 20th century, runs of salmon in the Smith River sustained the operation of a cannery near its mouth. Some cannery records dating from the 1890's documented the processing of 50 tons of salmon per year (Bartson 1997). Coho salmon are currently found throughout the HU, although their numbers are typically small. Preliminary Smith River results from the 2002 Department presence/absence surveys of streams historically inhabited by coho salmon (Brown and Moyle 1991) shows a percentage increase in coho salmon presence over the previous year's data (79%-82%).

Problems facing anadromous salmonids in the Smith River include amount of available habitat, degraded condition of riparian vegetation, poor LWD recruitment, altered estuarine environment, excess sediment, compacted stream gravels, and fish passage.

7.2.2.1 Recommendations for the Smith River HU

SM-HU-01 Develop and implement a program to control exotic vegetation, particularly canary grass, which impedes access to and use of tributaries by coho salmon.

SM-HU-02 Assess, prioritize and treat barriers to passage and other impediments to use (including water diversion), especially those blocking access to and use of smaller tributaries, including Clarks, Morrison, Peacock, Sultan and Little Mill creeks.

SM-HU-03 Develop and implement a plan to restore the effectiveness and use of off-channel areas, sloughs, and wetlands. Yontocket, Tillas and Tryon sloughs should be given immediate attention. Since a portion of Yontocket Slough is state property, the restoration of connectivity and functionality of this slough should be given priority.

SM-HU-04 Investigate the feasibility of restoring channelized reaches of streams to natural meander belts (e.g., Lower Rowdy Creek and Dominie Creek) that would allow recruitment of stored spawning gravel, reestablish scour pools, recruit woody debris from banks, and ultimately restore fluvial processes that maintain coho salmon habitat.

SM-HU-05 Improve the quality and quantity of deep pools, spawning gravels, and cover by measures to:

a. Protect existing LWD recruitment potential through the retention of mature coniferous trees in the riparian zone,

b. Establish adequate streamside buffer areas that are protected from vegetation removal,

c. Increase the amount of in-channel LWD,

d. Continue to review THPs, and

e. Continue riparian management projects with ranchers.

SM-HU-06 Assess the impacts of steelhead outplanting at the Rowdy Creek Hatchery.

SM-HU-07 Adequately treat legacy sources of sediment and provide for minimization of new sediment input.

SM-HU-08 Support the use of the existing watershed coordinator to aid in implementing recommendations.

7.2.2.2 Mill Creek HSA (Priority Map Values: 5-4-4-5)

Mill Creek enters the Smith River approximately 15 river miles from the mouth. The main tributaries to Mill Creek include West Branch Mill, East Fork Mill, and Bummer Lake Creek. Numerous first and second order tributaries feed these streams. Much of the 22,400-acre (35 mi^2) basin is privately owned (timber production) with approximately 6,400 acres (10 mi^2) managed by Redwood National and State Parks.

Mill Creek is one of the most productive tributaries for salmon and steelhead in the entire Smith River watershed. All species of salmonids present in the Smith River basin can be found in the Mill Creek watershed.

Problems facing anadromous salmonids in the Mill Creek HSA include poor LWD recruitment, fish passage, degraded riparian vegetation, and sediment input from the road network on public lands acquired from Stimpson Lumber.

Recommendations for the Mill Creek HSA are:

SM-MC-01 Assess, prioritize, and treat sediment sources (mostly legacy roads).

SM-MC-02 Develop and implement a short-term plan to add LWD and a long-term plan to promote recruitment of LWD.

SM-MC-03 Develop and implement a plan for riparian planting.

7.2.2.3 Wilson Creek HSA (Priority Map Values: 5-4-5-5)

Wilson Creek is a tributary to the Pacific Ocean located approximately 4 miles north of the Klamath River mouth. The lower section of this coastal watershed lacks an estuary. The creek runs directly into a semi-protected section of coastline where wave action at the creek's entrance is cushioned by exposed rocks. The lower channel is intermittent during the summer, thus emigrating smolts have a discrete window in which to leave the watershed.

Although adult coho salmon have not been observed during spawning surveys, juveniles/smolts are found frequently in juvenile dive counts and electrofishing within Wilson Creek. Their numbers, however, are very low, which may factor into low observed adult escapement numbers (SRCo 2002).

Problems facing anadromous salmonids include inadequate in-stream habitat complexity, degraded riparian vegetation, and excess sediment input.

Recommendations for the Wilson Creek HSA are:

SM-WC-01 Work with landowners to determine the amount of LWD necessary for improved flushing, pooling and habitat conditions for coho salmon, facilitate immediate placement, and develop a plan for long-term recruitment

SM -WC-02 Develop a plan to increase connectivity of riparian habitat through fencing and planting.

SM-WC-03 Support the assessment, prioritization, and treatment of sources of sediment.

7.2.2.4 Smith River Plain HSA (Priority Map Values: 4-5-4-5)

SM-PL-01 Support the assessment, prioritization, and treatment of barriers to passage.

SM-PL-03 Support an assessment of the entire watershed.

SM-PL-04 Support prioritization and implementation of recommendations of the watershed assessment.

7.2.2.5 HSAs with No Recommendations

Hydrologic Subarea	Priority Map Values
Rowdy Creek HSA	5-4-4-5
South Fork Smith River HSA	4-3-4-5
Middle Fork Smith River HSA	4-4-4-5
North Fork Smith River HSA	4-3-4-5

7.2.3 KLAMATH RIVER HYDROLOGIC UNIT [2]

The origin of the Klamath River is at the outflow of Upper Klamath Lake, north of Klamath Falls, Oregon (Figure 7-2). The Upper Klamath River Basin has been highly modified over the past ninety-years, with 80-90% of historic wetlands having been reclaimed for agricultural, urban, and other development. On average, approximately 500,000 acre feet of water are diverted near the outlet of Upper Klamath Lake to provide irrigation deliveries to 200,000 acres of farmland within the U.S. Bureau of Reclamation's Klamath Project. Some of this water, in a warmed and more nutrified state, reenters the Klamath River at Keno, Oregon.

The Middle Klamath River extends from Iron Gate Dam downstream to the mouth of the Salmon River; the Lower Klamath River is from the mouth of the Salmon River to the mouth of the Klamath River at the Pacific Ocean. It is California's second largest river, draining a watershed of approximately 979,816 acres (1,531 mi^2). The Klamath River HU has 1,832 miles of waterways, of which 1,780 miles (97%) are naturally occurring and 1,535 miles (84%) are perennial in nature. Major tributaries include the Trinity, Salmon, Scott, and Shasta rivers. Numerous other tributaries enter the Klamath River along its length.

Upper Klamath Lake is shallow and hypereutrophic, causing the water of the Klamath River at this point to be poor in quality for much of the year and to be listed by the EPA as impaired for temperature, dissolved oxygen, and nutrients. Anadromous fish have been blocked from the upper basin since 1910 when Copco #1 Dam construction was started. Habitat alteration and water diversions have degraded Klamath River water quality, reduced total annual discharge, and altered the magnitude, timing and duration of flow so that more water runs downstream during winter months and less during the spring and summer than occurred historically.

Information on adult coho salmon returns to the Klamath basin is spotty prior to the construction of Iron Gate and Trinity River hatcheries. Coho salmon were thought to spawn in most tributaries to the Klamath from the mouth to at least Bogus Creek

[2] The discussion of the Klamath River HU does not include the Salmon River HA, Shasta Valley HA, Scott River HA, or the Trinity River HU, all of which are discussed below.

(CDFG 1979). During the 1960s, coho salmon escapement for the mainstem and its minor tributaries (excluding the Shasta, Scott, Salmon and Trinity rivers) was estimated at 8,000.

Problems facing anadromous salmonids in the Klamath River include an altered hydrograph, high summer water temperatures, lack of access to available habitat, erosion and sedimentation, degraded condition of riparian vegetation, depleted LWD, unscreened water diversions, legacy impacts from historical mining, and agricultural conversion.

7.2.3.1 Recommendations for the Klamath River HU

KR-HU-02 Facilitate development of an adaptive management plan in preparation for low-flow emergencies in cooperation with the Bureau of Reclamation, NOAA Fisheries, USFWS, DOI, tribes, SWQCB and other stakeholders.

KR-HU-03 Develop a plan to restore and maintain tributary and mainstem habitat connectivity where low flow or sediment aggradation is restricting fish passage.

KR-HU-06 Recommend that the Bureau of Reclamation implement the Trinity River TMDL instream flushing flows without affecting ROD allocations.

KR-HU-07 Analyze the feasibility and appropriateness of site-specific 2084 permits for sport fishing for hatchery coho salmon.

KR-HU-09 Apply protective down-ramp rates at Iron Gate Dam to minimize stranding of coho salmon fry.

KR-HU-10 Support efforts to improve water quality coming into the Klamath River mainstem from the Upper Klamath Basin.

KR-HU-15 Address water quality and quantity problems in Klamath tributaries that exacerbate mainstem water quality problems.

KR-HU-17 Continue disease monitoring of juvenile salmon emigration in the Klamath River mainstem so that major disease outbreaks can be identified and their causes evaluated.

KR-HU-20 Restore appropriate coarse sediment supply and transport near Iron Gate Dam. Means to achieve this could include full or partial removal of the Klamath Project, or gravel introduction such as is done below other major dams (e.g., Trinity Dam).

KR-HU-21 Step up roads and fuels management, especially in tributaries with potential to contribute catastrophic loads of sediment to the mainstem Klamath.

7.2.3.2 Klamath Glen HSA (Priority Map Values: 5-5-5-5)

The Klamath Glen HSA is located between the mouth at the Pacific Ocean and the confluence of the Trinity River. Recent presence/absences survey in this HSA, have indicated that coho salmon are present in much of their historic habitat.

Problems facing coho salmon in the Klamath Glen HSA include a population of feral cattle in lower Blue and Bear creeks impacting riparian vegetation and increasing streamside erosion, excessive sedimentation and erosion due to removal of up to 90% of cover from some tributaries, low habitat diversity, loss of confluence connectivity, reduced quantity and habitat complexity. Many deep areas of the estuary have been filled in by excessive sedimentation, which may affect the mixing zone and be impacting food availability for juvenile salmonids. Rearing duration may be shorter now due to loss of habitat in the estuary.

Recommendations for the Klamath Glen HSA are:

KGHSA-01 Support the continuation of long-term estuary investigations to better understand the estuary's role in the survival of Klamath Basin coho salmon.

KGHSA-02 Develop a plan to restore off-channel estuarine, wetland, and slough habitat in lower Hunter and Salt creeks:

a. Investigate the purchase of key properties, conservation easements, or development rights from willing sellers; and

b. Encouraging the installation of livestock exclusion fencing to protect restored areas.

KGHSA-04 Plan for the protection and restoration of Klamath mainstem tributaries, even those that do not support populations of coho salmon but that provide cool water and which improve mainstem Klamath water quality, particularly during warm summer months. Actions should:

a. Protect and/or restore riparian habitat,

b. Stabilize upslope areas to prevent sedimentation and aggradation of tributaries at their mouths, and

c. Improve federal land management to reduce impacts to riparian corridors and sediment loads.

KGHSA-05 Support actions to reduce sediment input from upslope sources, such as to:

a. Decommission roads and skidtrails.

b. Upgrade roads and maintenance practices,

c. Ensure adequate fish migration is provided for at stream/road crossings,

d. Stabilize slopes to minimize or prevent erosion and to minimize future risk of eroded material entering streams, and

e. Minimize alteration of natural hillslope drainage patterns.

KGHSA-07 Support treating sediment sources and improving riparian and instream habitat conditions to provide adequate and stable spawning and rearing areas for coho salmon.

KGHSA-08 Develop a plan to restore in-channel and riparian habitat in tributaries:

a. Revegetate riparian zones with native species (e.g., conifers) to stabilize streambanks and promote a long-term supply of LWD;

b. Provide adequate protection from development, grazing, etc. for riparian areas; and

c. Relocate roads out of riparian areas where feasible.

KGHSA-12 Express appreciation for the outstanding cooperation between Tribes and Simpson Timber Company.

KGHSA-13 Supplement on-going efforts to provide short-term and long-term benefits to coho salmon by restoring LWD and shade through:

a. LWD placement;

b. Management to promote conifer recruitment;

c. Improvement of existing riparian zones through plantings, release of conifers, and control of alders, blackberries, and other competitors; and

d. Incentives to landowners, such as technical support.

7.2.3.3 Orleans HSA (Priority Map Values: 2-2-3-5)

The Orleans HSA is located between the confluence of the Trinity River and the confluence of the Salmon River. Recent present/absence surveys have found coho salmon in many of the main tributaries that enter the Klamath River in this HSA.

The main problems facing coho salmon in the Orleans HSA include potential impacts from timber harvesting, water diversions, gravel extraction, stream channelization and excessive sediment input, elevated summer water temperatures, and connectivity to tributaries.

Recommendations for the Orleans HSA are:

KR-OR-01 Develop a plan to protect and restore tributaries, even those that do not support populations of coho salmon that provide cool water and which improve mainstem Klamath water quality and which provide thermal refugia for fish, particularly during warm summer months. The plan should:

a. Include improved land management to reduce impacts to riparian corridors, reduce sediment loads, and protect water resources;

b. Request SWRCB to review existing water appropriations for compliance;

c. Petition the SWRCB to designate streams with critical summer flows as fully appropriated streams during the appropriate period; and

d. Provide measures that reduce hydrologic connectivity between streams and roads where feasible.

KR-OR-02 Support activities to maintain connectivity (flow) between mainstem habitat and tributary habitat in Slate and Red Cap creeks.

KR-OR-04 Develop a plan to protect and enhance Bluff and Red Cap creek watersheds, which are classified as Key Watersheds in the Northwest Forest Plan. Key watersheds serve as refugia for maintaining and recovering habitat for stocks of anadromous fish at risk, such as coho salmon.

KR-OR-07 Support actions to reduce sediment input from upslope sources, including measures to:

a. Decommission roads and skidtrails,

b. Upgrade roads and maintenance practices,

c. Ensure adequate fish migration is provided for at stream/road crossings,

d. Stabilize slopes to minimize or prevent erosion and to minimize future risk of eroded material entering streams, and

e. Minimize alteration of natural hillslope drainage patterns.

7.2.3.4 Ukonom HSA (Priority Map Values: 5-3-3-4)

The Ukonom HSA is located between the confluence of the Salmon River and the confluence of Indian Creek. Recent presence/absence surveys indicate that coho salmon were not found in a number of tributaries that they historically inhabited.

Problems facing anadromous salmonids in this HSA include barriers to migration, elevated water temperatures; undersized culverts in the Elk Creek watershed, unstable spawning gravels depleted LWD unscreened water diversions, increased erosion and acid discharge, heavy metals and cyanide discharge from the Siskon Mine in the Dillon Creek watershed.

Recommendations for the Ukonom HSA are:

KR-UK-01 Develop a plan to protect and restore tributaries, even those that do not support populations of coho salmon, that provide cool water, improve mainstem Klamath water quality, and provide thermal refugia for fish, particularly during warm summer months. The plan should:

a. Include improved land management to reduce impacts to riparian corridors, reduce sediment loads, and protect water resources;

b. Request that SWRCB review existing water appropriations for compliance;

c. Petition the SWRCB to designate streams with critical summer flows as fully appropriated streams during the appropriate period; and

d. Provide measures that reduce hydrologic connectivity between streams and roads where feasible.

KR-UK-02 Support actions to reduce sediment input from upslope sources, including measures to:

a. Decommission roads and skidtrails,

b. Upgrade roads and maintenance practices,

c. Ensure adequate fish migration is provided for at stream/road crossings,

d. Stabilize slopes to minimize or prevent erosion and to minimize future risk of eroded material entering streams, and

e. Minimize alteration of natural hillslope drainage patterns.

KR-UK-04 Develop a plan to ensure continued yields of high quality water and the maintenance the ecological function of tributary riparian systems, including measures to:

a. Conduct of riparian revegetation and streambank restoration;

b. Encourage, where feasible, the relocation of roads out of riparian areas and off of unstable land features (e.g., active landslides, granitic terrain, toe zones, wet-seepy areas);

c. Increase the number of conifers and deciduous trees, where appropriate, for more stable stream banks, stream shading, and eventual recruitment of LWD; and

d. Revegetate floodplain areas using native species.

KR-UK-05 Supplement on-going efforts to provide short-term and long-term benefits to coho salmon by restoring LWD and shade through:

a. LWD placement;

b. Management to promote conifer recruitment;

c. Improvement of existing riparian zones through plantings, release of conifers, and control of alders, blackberries, and other competitors; and

d. Incentives to landowners, such as technical support.

KR-UK-09 Increase efficiency of water diversions and delivery systems.

KR-UK-10 Continue restoration and monitoring of Siskon Mine to prevent further degradation of the riparian resource.

7.2.3.5 Happy Camp HSA (Priority Map Values: 4-3-4-5)

The Happy Camp HSA is located between the confluence of Indian Creek and the confluence of Grider Creek.

Problems facing anadromous salmonids include, reduction in water quality (increased turbidity); acid mine drainage and heavy metal contamination from Grey Eagle Mine, elevated water temperatures in some tributaries, degraded quantity and quality of riparian vegetation, depleted LWD, unscreened water diversions and disrupted natural movement of watershed products (water, large woody debris, sediment) and fish due to culverts and road crossings in the Thompson Creek Watershed.

Recommendations for the Happy Camp HSA are:

KR-HC-01 Develop a plan to protect and restore tributaries, even those that do not support populations of coho salmon, that provide cool water, improve mainstem Klamath water quality, and provide thermal refugia for fish, particularly during warm summer months. The plan should:

a. Improve land management to reduce impacts to riparian corridors, reduce sediment loads, and protect water resources;

b. Request that SWRCB review existing water appropriations for compliance;

c. Petition the SWRCB to designate streams with critical summer flows as fully appropriated streams during the appropriate period; and

d. Provide measures that reduce hydrologic connectivity between streams and roads where feasible.

KR-HC-02 Support actions to reduce sediment input from upslope sources, including measures to:

a. Decommission roads and skidtrails,

b. Upgrade roads and maintenance practices,

c. Ensure adequate fish migration is provided for at stream/road crossings,

d. Stabilize slopes to minimize or prevent erosion and to minimize future risk of eroded material entering streams, and

e. Minimize alteration of natural hillslope drainage patterns.

KR-HC-05 Supplement on-going efforts to provide short-term and long-term benefits to coho salmon by restoring LWD and shade through:

a. LWD placement,

b. Management to promote conifer recruitment,

c. Improvement of existing riparian zones through plantings, release of conifers, and control of alders, blackberries, and other competitors, and

d. Incentives to landowners, such as technical support.

KR-HC-08 Encourage installation of screens on diversions to Department-NOAA Fisheries standards. Provide funding incentives to landowners where necessary to achieve this goal.

KR-HC-09 Increase efficiency of water diversions and delivery systems where feasible and appropriate. Provide funding and incentives to landowners where necessary to meet this goal.

KR-HC-10 Encourage the North Coast RWQCB to continue monitoring Grey Eagle Mine and tailings as a follow-up to remediation that has already been done. Urge EPA Region 9 to consider coho salmon when dealing with both emergency and remedial actions.

7.2.3.6 Seiad Valley HSA (Priority Map Values: 4-4-4-4)

The Seiad Valley HSA is located between the confluence of Grider Creek and the confluence of Horse Creek.

Problems facing anadromous salmonids include reduction in water quality (increased turbidity) in Walker Creek, elevated water temperatures in some tributaries, degraded riparian vegetation in Seiad Creek, depleted LWD, unscreened water diversions, disrupted natural movement of watershed products (water, large woody debris, sediment) and fish passage due to road culverts and crossings in Seiad and Grider Creek Watersheds

Recommendations for the Seiad Valley HSA are:

KR-SV-01 Develop a plan to protect and restore tributaries, even those that do not support populations of coho salmon, that provide cool water, improve mainstem Klamath water quality, and provide thermal refugia for fish, particularly during warm summer months. The plan should:

a. Improve land management to reduce impacts to riparian corridors, reduce sediment loads, and protect water resources;

b. Request that SWRCB review existing water appropriations for compliance;

c. Petition the SWRCB to designate streams with critical summer flows as fully appropriated streams during the appropriate period; and

d. Provide measures that reduce hydrologic connectivity between streams and roads where feasible.

KR-SV-02 Support actions to reduce sediment input from upslope sources:

a. Decommission roads and skidtrails,

b. Upgrade roads and maintenance practices,

c. Ensure adequate fish migration is provided for at stream/road crossings,

d. Stabilize slopes to minimize or prevent erosion and to minimize future risk of eroded material entering streams, and

e. Minimize alteration of natural hillslope drainage patterns.

KR-SV-04 Develop a plan to ensure continued yields of high quality water and to maintain the ecological function of tributary riparian systems, including measures to:

a. Conduct riparian revegetation and streambank restoration;

b. Encourage the relocation of roads out of riparian areas and off of unstable land features (e.g., active landslides, granitic terrain, toe zones, wet-seepy areas);

c. Increase the number of conifers and deciduous trees, where appropriate, for more stable stream banks, stream shading, and eventual recruitment of LWD; and

d. Revegetate floodplain areas using native species.

KR-SV-05 Supplement on-going efforts to provide short-term and long-term benefits to coho salmon by restoring LWD and shade through:

a. LWD placement;

b. Management to promote conifer recruitment;

c. Improvement of existing riparian zones through plantings, release of conifers, and control of alders, blackberries, and other competitors; and

d. Incentives to landowners, such as technical support.

KR-SV-08 Encourage installation of screens on diversions to Department-NOAA Fisheries standards. Provide funding incentives to landowners where necessary to achieve this goal.

KR-SV-09 Study the likely benefits to instream flow of increasing the efficiency of water diversions and delivery systems where feasible and appropriate. Provide funding and incentives to landowners where necessary to meet actions that are given a high priority.

7.2.3.7 Beaver Creek HSA (Priority Map Values: 4-4-4-4)

The Beaver Creek HSA is located between the confluence of Horse Creek and the Shasta River. Problems facing anadromous salmonids in this HSA include high sediment levels in Beaver Creek as a result of the extensive road systems in the watershed, lack of large woody debris needed for habitat complexity in Beaver Creek, and degraded riparian vegetation.

Recommendations for the Beaver Creek HSA are:

KR-BC-02 Encourage landowners to manage fuels to prevent catastrophic fires and to evaluate the application of the Watershed Evaluation Mitigation Addendum.

KR-BC-03 Assess fine sediment production and delivery from the USFS road adjacent to the West Fork of Beaver Creek and implement appropriate remediation.

KR-BC-05 Support actions to reduce sediment from upslope sources such as:

a. Decommission roads and skidtrails,

b. Upgrade roads and maintenance practices,

c. Ensure adequate fish migration is provided for at stream/road crossings,

d. Stabilize slopes to minimize or prevent erosion and to minimize future risk of eroded material entering streams,

e. Minimize alteration of natural hillslope drainage patterns, and

f. Encourage the relocation of roads out of riparian areas and off of unstable land features (e.g., active landslides, granitic terrain, toe zones, wet-seepy areas).

7.2.3.8 HSAs with No Recommendations

Hornbrook HSA (Priority Map Values: 2-2-3-4): The Hornbrook HSA is located between the confluence of the Shasta River and the Confluence of Little Bogus Creek. Problems facing coho salmon in the Hornbrook HSA include a major impoundment on Cottonwood Creek and irrigation diversions that cause the stream to go dry on some reaches during the summer. In addition, spawning gravels in Cottonwood Creek were depleted during the Construction of Interstate 5.

Iron Gate HSA (Priority Map Values: 4-4-3-1): The anadromous portion of the Iron Gate HSA is located between the confluence of Little Bogus Creek and the Iron Gate Dam. Problems facing coho salmon in the Iron Gate HSA include water diversions, fish passage, and sedimentation on Bogus Creek.

Copco Lake HSA (Priority Map Values: 0-1-2-1): The Copco Lake HSA is located upstream of Copco Lake and completely out of anadromous waters. Therefore the problems facing coho salmon in the Copco Lake HSA are the inability of migrating salmon to pass Iron Gate Dam

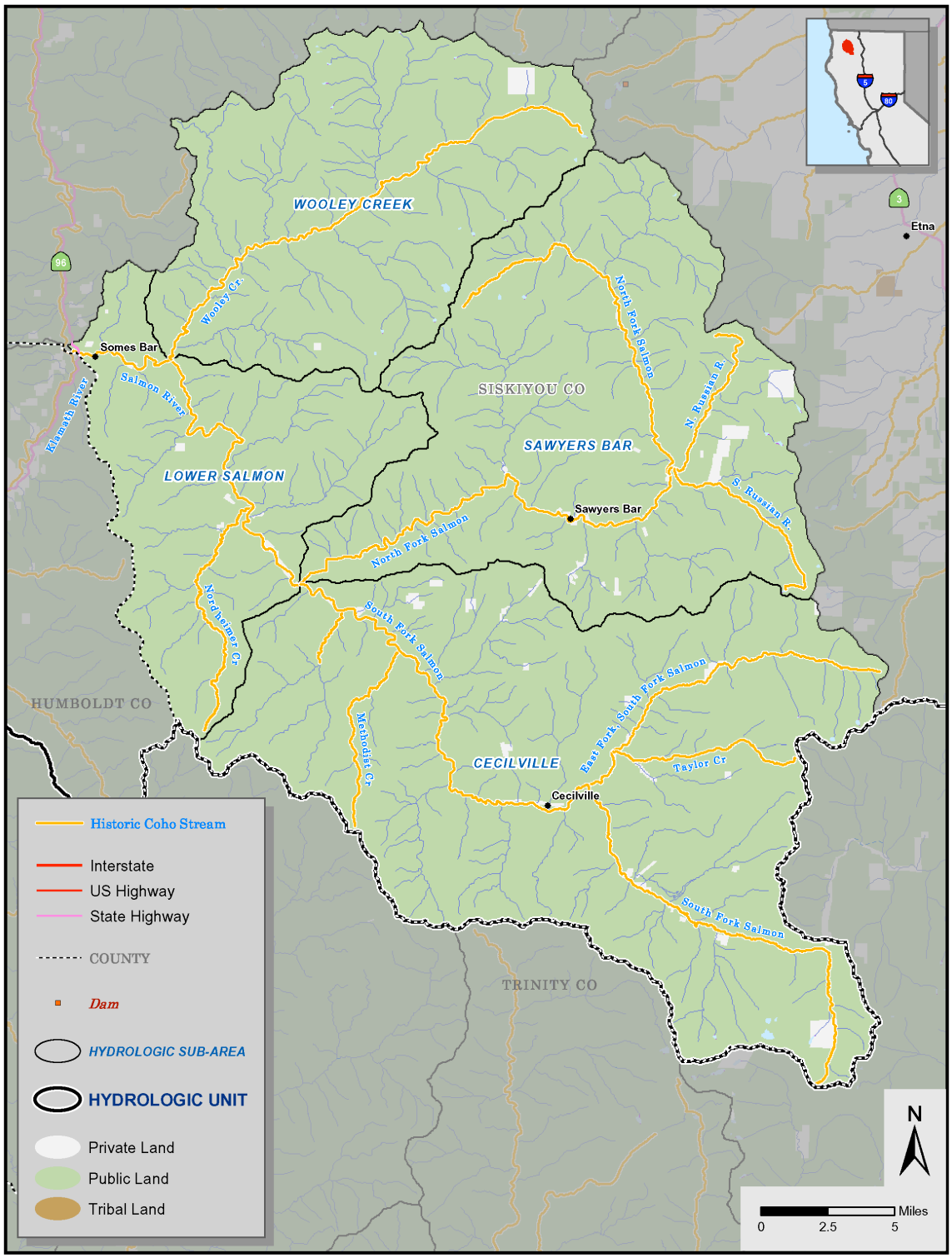
7.2.4 SALMON RIVER HYDROLOGIC AREA

The Salmon River is located in remote northwestern California in the Klamath Mountains (Figure 7-4). It is a major tributary to the Klamath River. The Salmon River drains an area of 480,626 acres (751 mi^2). Elevations in the watershed range from about 500 to 9,000 feet above sea level. The area contains steep slopes along much of the river, and tributary streams flow through isolated remote canyons with moderate to high gradients. The riverbed is formed by bedrock and boulder controls, but some alluvial reaches contain gravel and cobble substrates. The headwaters originate in the pristine Marble Mountain, Russian, and Trinity Alps Wilderness Areas, administered by the Shasta-Trinity and Klamath National Forests. There are approximately 1,414 miles of streams within the watershed, of which 740 miles are perennial in nature. The Salmon River watershed contains one of the most species-diverse temperate forests in the world. There are fourteen different recognized wildlife habitat community types present in the watershed.

Nearly the entire Salmon River watershed is under federal ownership and administered by the Forest Service. Management activities are strongly influenced by the Northwest Forest Plan with over 25% of the watershed identified as Late Successional Reserve. The Salmon River has been identified as a "Key Watershed" under the Klamath River Watershed Assessment.

Historically, coho salmon habitat was estimated to include 105 miles along the Salmon River and its tributaries (CDWR 1965). More recent estimates suggest that coho salmon have access to about 85 miles (CH2M HILL 1985). California

FIGURE 7-4: Salmon River Hydrologic Area



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Department of Water Resources estimated historical coho salmon runs in the Salmon River at 2,000 fish (CDWR 1965). The Department's annual coho salmon spawning escapement estimate for the early 1960's was 800 fish (CDFG 1965). Between 1985 and 1991, the Department operated a weir in the Salmon River near its mouth and recorded a low of two coho salmon in 1985 and a high of 75 coho salmon in 1987.

Problems facing coho salmon in the Salmon River watershed include invasive exotics, barriers to fish passage, depleted LWD, high sediment loads from the extensive road system and past large wildfires, limited riparian function due to tailing piles from hydraulic mining, unscreened water diversions, and unstable spawning gravels.

7.2.4.1 Recommendations for the Salmon River HA

SA-HA-01 With the goal of reducing sediment and providing fish passage at all life history stages where roads affect streams inhabitated by coho salmon:

a. Request that USFS implement recommendations for roads already assessed and accelerate the Northwest Forest Plan road assessment schedule,

b. Encourage Siskiyou County to complete road sediment inventory assessment and implement treatment of County roads, and

c. Encourage Siskiyou County to implement recommendations of the completed assessment of barriers.

SA-HA-02 Establish a multi-agency task force to assume implementation of barrier removal. This task force would include at a minimum, representatives from Salmon River Restoration Council, USFS, NOAA Fisheries, USFWS, and the Department.

SA-HA-04 Support the on-going efforts of Salmon River Restoration Council to deal with invasive exotics using Integrated Past Management.

SA-HA-05 Reduce the risk of catastrophic fires through fuels management around residential structures and homes. Implement Fire Safe Council recommendations promoting the reduction of fuel near residences to reduce human-caused fires spreading into the forest and causing harm to coho salmon habitat.

SA-HA-6 Investigate how USFS is dealing with riparian and aquatic conservation in Northwest Forest Plan regarding fire suppression and fuels management and encourage the USFS to consider coho salmon in their overall fuel management plan.

SA-HA-07 Recognize the Salmon River Restoration Council's value for cost-effective education and restoration.

SA-HA-08 Encourage USFS to continue to work closely with the Salmon River Restoration Council.

SA-HA-09 Supplement on-going efforts to provide short-term and long-term benefits to coho salmon by restoring LWD and shade through:

a. LWD placement;

b. Management to promote conifer recruitment;

d. Improvement of existing riparian zones through plantings, release of conifers, and control of alders, blackberries, and other competitors; and

e. Incentives to landowners, such as technical support.

SA-HA-10 Develop a plan to remediate mine tailings.

7.2.4.2 HSAs with No Recommendations

Lower Salmon HSA (Priority Map Values: 2-1-3-5): Problems facing coho salmon include excessive sediment from roads and landslides, streambed instability in Nordheimer Creek from aggradation during the flood of 1964, and habitat degradation in Crapo Creek and an upper reach of Nordheimer Creek caused by sediment input resulting from past forest fires.

Wooley Creek HSA (Priority Map Values: 1-1-2-5): Wooley Creek is a designated wilderness and provides habitat conditions largely unaffected by human influence.

Sawyers Bar HSA (Priority Map Values: 2-2-3-5): Problems facing coho salmon in the Sawyers Bar HSA include sediment input sediment input from roads, marginal summer water temperature conditions resulting from the broad, unvegetated floodplain and riparian areas and waste discharge from mine tailings.

Cecilville HSA (Priority Map Values: 4-4-4-5): Problems facing coho salmon in the Cecilville HSA include lack of deep pools for holding adults and juvenile rearing, summer water temperature conditions resulting from broad, unvegetated floodplain, impacts from past hydraulic mining and lack of potential winter rearing habitat, particularly cover in slow velocity areas.

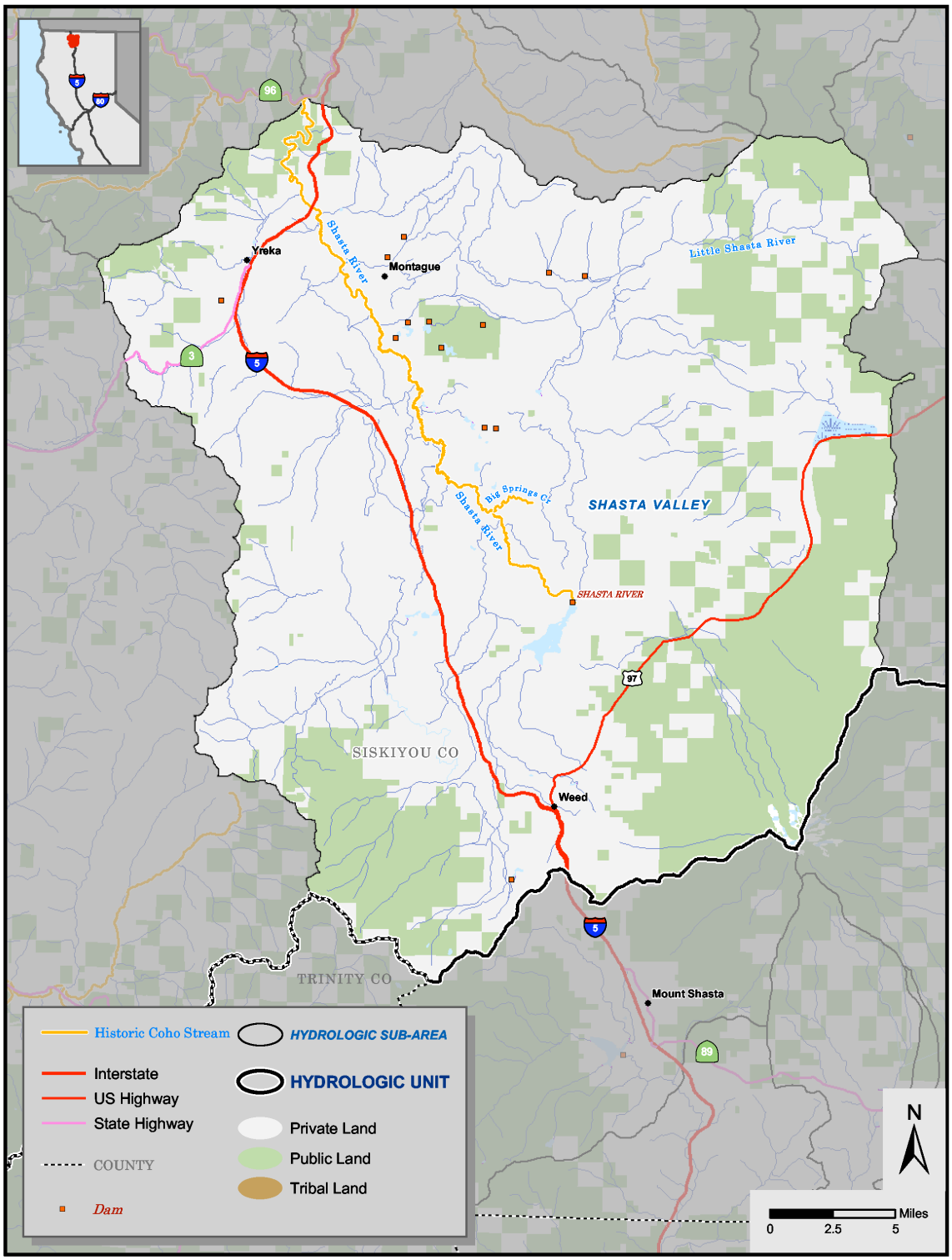
7.2.5 SHASTA VALLEY AND SCOTT RIVER HYDROLOGIC AREAS

This section includes the recommendations for the Shasta Valley HA and the Scott River HA that that do not relate to agricultural water and land use. The recommendations developed by SSRT for the Shasta-Scott Pilot Program to deal with agricultural water and land use issues are presented in Chapter 8.

7.2.5.1 Shasta Valley HA/HSA (Priority Map Values: 5-4-4-3)

The Shasta Valley HA is part of the Klamath River HU and consists of one HSA, the Shasta Valley HSA (Figure 7-5). The Shasta Valley HSA covers the Shasta River watershed, approximately 508,700 acres (793 mi^2). The Shasta River originates

FIGURE 7-5: Shasta Valley Hydrologic Area/Hydrologic Sub-Area



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within the higher elevations of the Eddy Mountains lying southwest of the town of Weed in Siskiyou County, California. It flows for approximately 50 miles in a northerly direction, passing through the Shasta Valley. After leaving the valley, it enters a steep-sided canyon where it flows for a distance of seven river miles before emptying into the Klamath River, 176.6 river miles upstream from the Pacific Ocean. The river drains a portion of the Cascade Province to the east and a portion of the Klamath Province to the west. The Shasta River Watershed is situated almost entirely within Siskiyou County. Numerous springs and a number of small tributary streams enter the Shasta River as it passes through the Shasta Valley. Glacial melting from Mt. Shasta and mountain precipitation provide the principle source of recharge for the river. Major tributaries include Parks Creek, Big Springs Creek, Little Shasta River, and Yreka Creek. The highest point in the Shasta Watershed is Mt. Shasta at just over 14,000 feet high. Where the Shasta River enters the Klamath River, the elevation is just over 2,500 feet .

Seventy-two percent of the Shasta Watershed and Shasta River is in private ownership. Access to the river and its tributaries is limited to a few miles of the lower Shasta River still in public ownership, at public road crossings, and at locations where a few landowners provide access. That portion of the Shasta River passing through BLM lands in the Shasta Canyon (approximately 3 river miles) is afforded protected status as an area of critical environmental concern. One instream mining permit is located on the Shasta River. Agriculture, silviculture, and timber management are the most prominent land uses. Coho salmon runs in the Shasta Valley HA probably averaged a little more than 1,000 fish annually in the late 1950's(CDFG 1959). In the early 1960's, the runs were estimated to average 600 fish (CDFG 1979). Current counts are low in comparison to these earlier estimates.

Problems facing coho salmon in the Shasta River HSA include reduced summer flows, loss of channel maintenance flows, fish access limitations, high water temperatures, low levels of dissolved oxygen, elevated nutrient levels, turbidity, limitation on spawning gravel quantity, loss of spawning gravel quality, loss of riparian habitat, barriers to fish passage, unscreened water diversions, legal and illegal harvest, lack of funding for planning and studies necessary to precede restoration or fill data gaps, lack of on-the-ground access for studies and dangerously low population numbers of coho salmon.

7.2.5.2 Scott River HA (Scott Valley HSA - Priority Map Values: 5-5-4-4) (Scott Bar HSA - Priority Map Values: 4-4-4-5)

The Scott River is one of four major tributaries of the Klamath River entering the Klamath at RM 143 at an elevation of 1,580 feet (Figure 7-6). The Scott River HA includes two HSAs, the Scott Valley HSA and the Scott Bar HSA. The Scott River watershed is a large area with substantial variation in geology, geomorphology, and

climate. The watershed drains approximately 520,617 acres (812.2 mi^2). Major tributaries to the 58-mile-long Scott River are Shackleford/Mill, Kidder, Etna, French, and Moffett creeks and the South and East Forks Scott River. Native vegetation consists of mixed-conifer forest on the western mountain slopes, with scattered meadows and brush, while the eastern mountains are covered by extensive areas of brush, oak, western juniper, and annual grass. The Scott River is part of the Klamath Mountain Province, which encompasses land in both Southern Oregon and Northern California.

The mainstem through Scott Valley is predominantly surrounded by irrigated farmland (32,000 acres; 50 mi^2) and rangeland comprising 16% of the watershed acreage. Remaining areas are upland areas of the watershed and are predominantly private owned and federally managed timberlands. The Klamath National Forest manages approximately 35% of the total Scott watershed acreage. The remaining (65%) acreage is under other public management or private ownership.

The Department of Fish and Game (1965) estimated that during the early 1960's, the Scott River's population of coho salmon was about 800 fish.

Problems facing coho salmon in the Scott Valley HSA include reduced stream flows caused by drought and exacerbated by human activities, increases stream temperatures, limited rearing areas during spring, summer and fall, restricts coho salmon access to spawning habitat in extreme drought years, increased disconnect between tributaries and mainstem starting in early July, stranding coho salmon juveniles, lack of sufficient summering habitat in tributaries, sedimentation of rearing pools and spawning gravels by sediment entering the system as a result of the cumulative effects of upslope land management, high summer water temperatures in rearing areas, lack of riparian cover in some tributary reaches, lack of instream structure for coho salmon rearing needs and lack of good information about coho salmon in the Scott system.

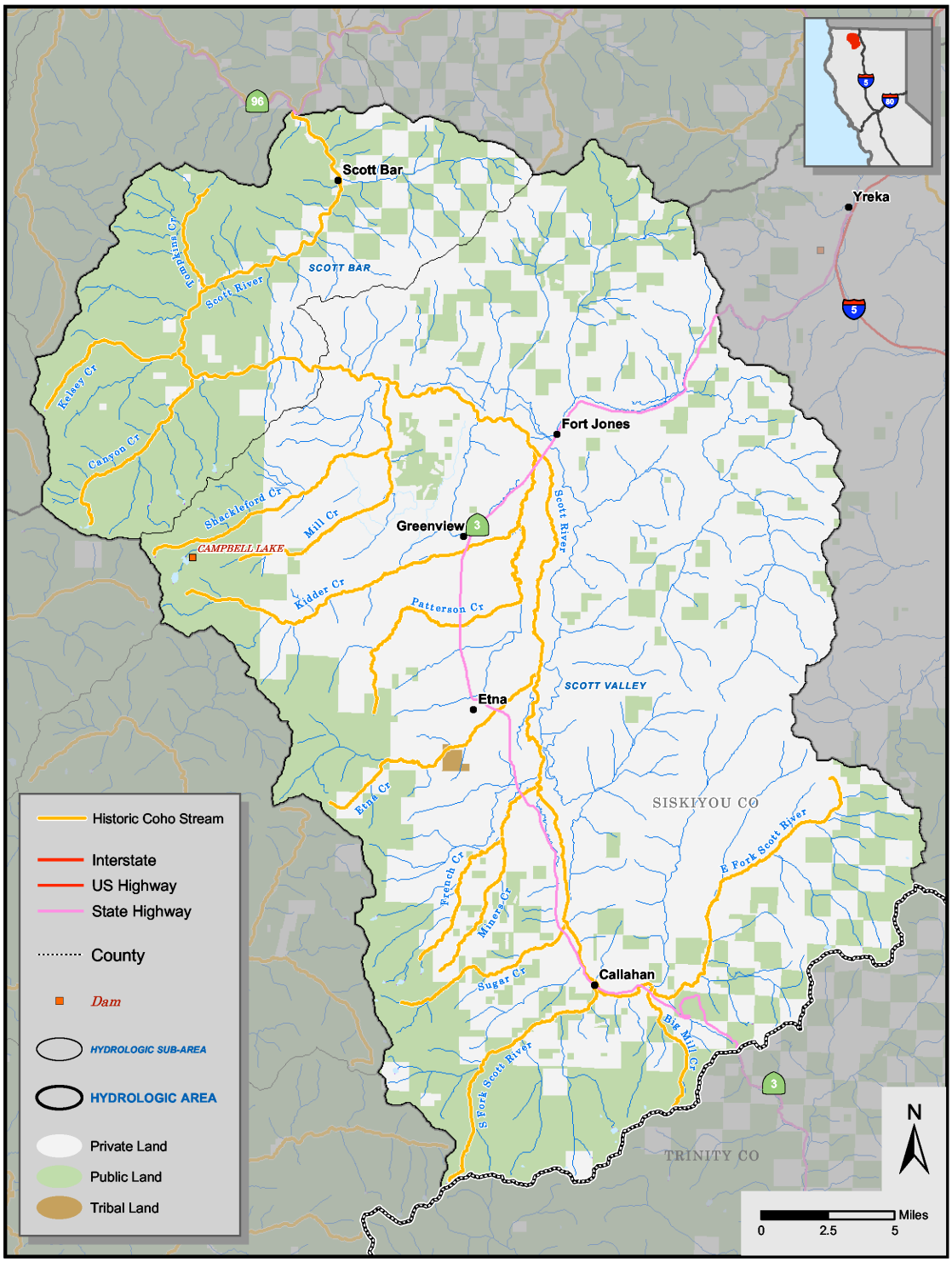
7.2.5.3 Recommendations for the Scott and Shasta Rivers (Non-agricultural)

SS-HA-01 Reduce the risk of catastrophic fires through fuels management (especially in the Scott) around residential structures and homes. Implement Fire Safe Council recommendations promoting the reduction of fuel near residences to reduce human-caused fires spreading into the forest and causing harm to coho salmon habitat.

SS-HA-02 Support actions to reduce anthropogenic-caused sediment input from upslope sources identified through public and private inventories. Prioritize remediation activities, which would include slope stabilization, minimizing sediment production, and eliminating fish passage barriers.

SS-HA-03 Encourage federal, state, and county agencies and private landowners to reduce impacts to coho salmon habitat from public and private road systems. Continue

FIGURE 7-6: Scott River Hydrologic Area



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road and/or watershed assessments to identify and prioritize sources and risks of road-related sediment delivery to watercourses. Support activities to:

a. Reduce road densities where necessary and appropriate;

b. Upgrade roads and road maintenance practices to eliminate or reduce the potential for concentrating run-off to streams during rainfall events. Employ best available technology when appropriate;

c. Decrease potential for stream flow to become diverted at road crossings during high flow events resulting in flow along the road that returns to the channel at undesirable locations;

d. Stabilize slopes to minimize or prevent erosion and to minimize future risk of eroded material entering streams;

e. Minimize alteration of natural hill slope drainage patterns; and

f. Encourage funding authorities to allocate adequate budgets to federal, state, and local agencies and private landowners for road maintenance activities, capital project activities, and dedicated funding to pay for fish passage projects.

SS-HA-04 Encourage funding authorities to allocate adequate resources to prioritize and upgrade culverts to provide fish passage within the range of coho salmon to pass 100-year flows and the expected debris loads (e.g., LWD that might be mobilized).

SS-HA-05 Identify barriers to passage and prioritize them for removal, through collaborative efforts with other agencies' needs.

SS-HA-06 Design and implement a reclamation plan to remediate effects of historical mining (i.e., tailings near Callahan) with the goal of enhancing the production and survival of coho salmon. Identify locations, costs, and restoration potential of intensively mined areas. (Carry out the same kind of planning for Trinity River and Indian Creek.)

SS-HA-07 Improve water quality by reducing or minimizing both domestic and municipal sources of nutrient input (i.e., sewage treatment plant discharge and storm drain runoff). Support efforts by cities and rural communities to complete system upgrades to achieve Clean Water Act compliance.

SS-HA-08 Minimize impacts of cattle grazing on watercourses as necessary and appropriate (i.e., providing off-site watering, preventing overgrazing, etc.).

SS-HA-09 Support cooperative state and local efforts to redirect Big Mill Creek into its historic channel under State Route 3, thereby restoring adult and juvenile coho salmon access to approximately 1.25 miles of quality spawning and rearing habitat.

SS-HA-10 Assess the potential benefits and technical feasibility of exercising the U.S. Forest Service right to stream flow in the Scott River for fish and wildlife within the Klamath National Forest under the Scott River Decree. This should be dealt with during the verification described in SSRT water management recommendations.

SS-HA-11 Request the Bureau of Reclamation to study the potential benefits of adjusting Iron Gate flows to better meet the needs of adult and juvenile life stages to enhance Scott/Shasta coho salmon production, consistent with the flow needs of the Klamath and Trinity rivers.

7.2.6 TRINITY RIVER HYDROLOGIC UNIT

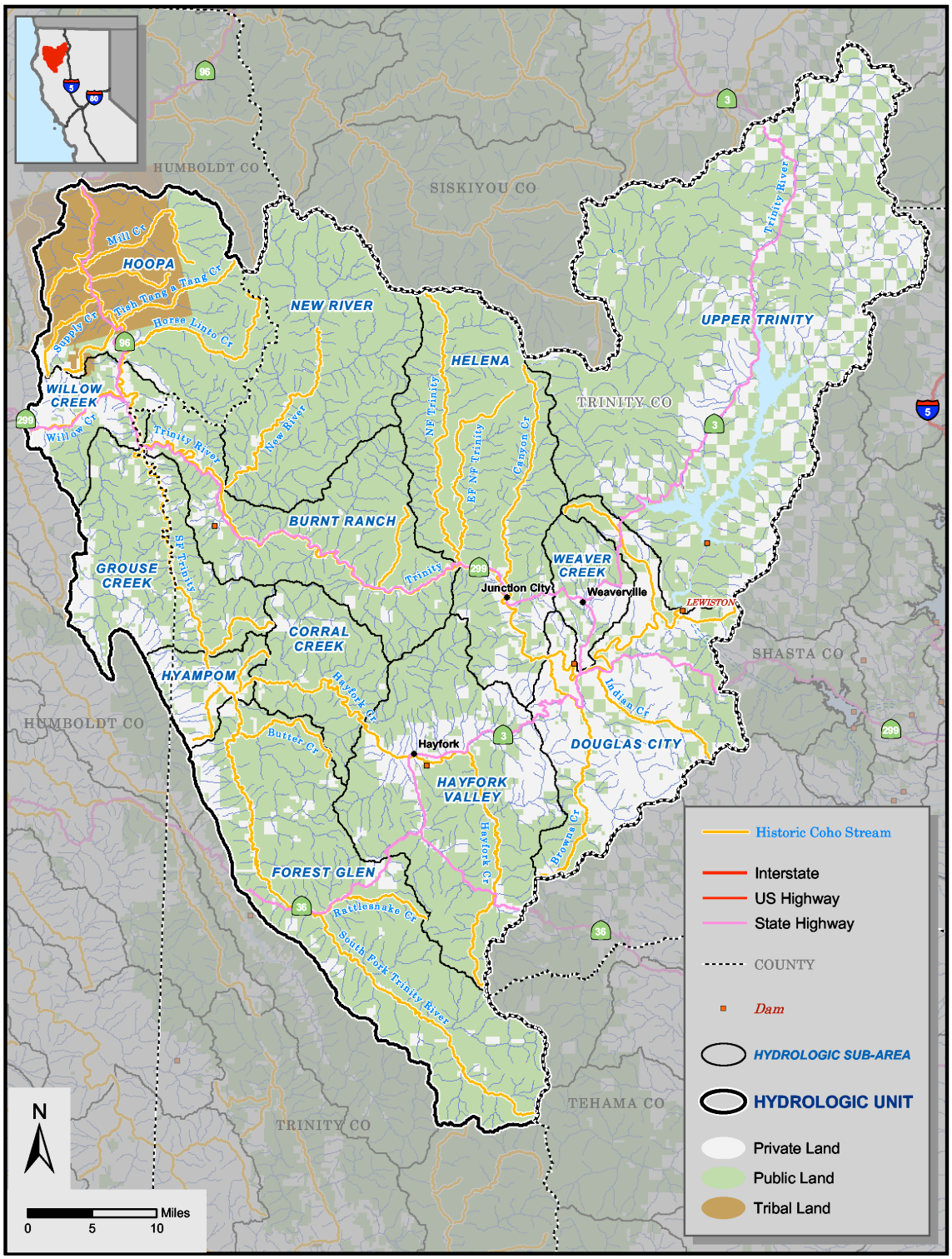
The Trinity River is the largest tributary to the Klamath River, draining approximately 1,304,179 acres (2,037.8 mi^2) in Humboldt and Trinity counties (Figure 7-7). The headwater streams originate in the pristine wilderness areas of the Trinity Alps and Trinity Mountains located in eastern Trinity County. From its headwaters, the river flows 172 miles south and west through Trinity County, then north through Humboldt County and the Hoopa Valley and Yurok Indian reservations until it joins the Klamath River at Weitchpec, about 40 river miles (RM) from the Pacific Ocean. Anadromous fish passage is blocked by Lewiston Dam approximately 112 RM upstream from the mouth of the Trinity River.

Most of the Trinity River Watershed is in public ownership (69% of land is managed as public multiple use lands, 7% as protected lands). Only 24% of the watershed is in private ownership. Two Indian tribes, the Hoopa and Yurok, have reservations located all or in part within the Trinity Basin. Both of theses tribes have subsisted on anadromous fish runs historically and continue to do so. Much of their culture and tradition is derived from resources found within the basin. Historically, gold mining was an important economic activity in the region, and today the watershed supports limited suction dredging activity. A few in-stream mining permits are located on the Trinity River. Commercial timber harvest supports the largest industry within the watershed. The Trinity River supports many recreational uses including fishing, white-water rafting, swimming, sightseeing, birding, and camping. Many of the smaller communities located along the river cater to, and depend on, these activities. Approximately 70% of the Trinity's flow at Lewiston (RM 112) is diverted to the Central Valley Project. This diversion is also used to generate electrical power at several dams, including Lewiston, along its course.

Estimates of coho salmon run-size, spawner escapement and angler harvest have been conducted since 1977 in the Trinity River Watershed. Estimates are generated using mark - recapture methods. Fish are trapped and tagged at a mainstem trapping weir near the town of Willow Creek (RM 30). Recoveries occur at Trinity River Hatchery (TRH), the upper-most point of migration. Mean run-size (grilse and adults combined) between 1977 and 1999 is 15,959 coho salmon.

Problems facing coho salmon in the Trinity River HU include degradation of spawning and winter rearing habitat due to sedimentation and past land use practices, sparse spawning gravel recruitment, high summer stream temperatures due to diversion of natural flow of Lewiston Dam, lack of deep pools, water diversions, irregular timing of flows, fragmentation of populations, possible genetic swamping from presumably inferior hatchery strains, migration barriers, water quality problems and unscreened diversions.

FIGURE 7-7: Trinity River Hydrologic Unit



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7.2.6.1 Trinity River HU Recommendations

TR-HU-03 Determine genetic make-up of current hatchery and natural stock and develop. Implement a hatchery genetic management plan (HGMP) for coho salmon to utilize the most fit and appropriate stock for use in the Trinity River.

TR-HU-04 Add a conservation element to the hatchery goals.

TR-HU-08 Support development of a County grading ordinance based on exemption, certification, and permitting criteria.

TR-HU-10 Support continued state and federal funding for the implementation of sediment reduction programs for private lands and the implementation of DIRT-prioritized sediment source sites treatment funding on County roads.

TR-HU-11 Urge Trinity County to establish incentives and standards for private riparian and wetlands area protection based on flexible subdivision design; road, curb and gutter requirements; minimum lot size and density; clustering and other techniques.

TR-HU-12 Urge Trinity County to establish riparian setbacks for grading activities on private lands, based on Fish and Game 1994 recommendations to District I counties.

TR-HU-13 Evaluate the impacts of non-native fish species on coho salmon and develop management guidelines to reduce impacts.

TR-HU-15 Analyze the feasibility and appropriateness of site-specific 2084 permits for sport fishing for hatchery coho salmon.

7.2.6.2 Douglas City HSA (Priority Map Values: 5-5-5-4)

The Douglas City HSA includes the mainstem of the Trinity River and its tributaries from Browns Creek upstream to Lewiston Dam. Problems facing coho salmon in the Douglas City HSA include unscreened water diversions, fish passage, reduce riparian function due to agricultural and grazing impacts, sedimentation from near-stream roads.

Recommendations for the Douglas City HSA are:

TR-DC-01 Investigate all water diversions on Reading Creek and Browns Creek. Restore fish passage and encourage instillation of screens to Department and NOAA Fisheries standards. Provide incentives to landowners when necessary to reach this goal.

TR-DC-02 Increase riparian function in lower Reading Creek and Browns Creek with conservation easements or landowner incentives that reduce agricultural and grazing impacts.

TR-DC-03 Implement sediment reduction plans consistent with County plans and policies.

7.2.6.3 Grouse Creek HSA (Priority Map Values: 5-3-3-3)

The Grouse Creek HSA includes the South Fork of the Trinity River and its tributaries from the confluence with the Trinity River mainstem up stream to Eltapom Creek. Problems facing coho salmon in the Grouse Creek HSA include impacts from past mining and problems associated with a large network of forest roads.

Recommendation for the Grouse Creek HSA is:

TR-GC-01 Support continued implementation of habitat restoration, including measures to stabilize upslope areas, enhance riparian zones, storm proof, stabilize, and/or decommission roads, and replace culverts.

7.2.6.4 Hyapom HSA (Priority Map Values: 1-1-2-3)

The Hyampom HSA includes the South Fork of the Trinity River and its tributaries from Eltapom Creek up stream to Hayfork Creek. Historical data show that the South Fork Trinity River and its larger tributaries were once important as spawning grounds for coho salmon. The frequency and size of coho salmon runs in the South Fork are not well documented, though they have been reported to migrate as far upstream as Hyampom.

Problems facing coho salmon in the Hyampom HSA include sediment load, unstable stream banks, migration barriers, low flows, lack of pools and cover resulting from large-scale water diversions and other land-use practices, lack of high quality rearing habitat, and a substantial change in channel morphology.

Recommendations for the Hyapom Creek HSA are:

TR-HY-01 Request that the USFS develop a management plan for Big Slide to reduce human contributions to mobilization of sediments, including evaluating relocation of the county road that crosses Big Slide.

TR-HY-02 Request that the USFS reduce fuel loading in stands that could be susceptible to catastrophic fire. Where appropriate, this management should include actions to accelerate the growth of conifers for LWD recruitment, develop mature shade canopy in the riparian zone, and to provide for other multiple use goals.

7.2.6.5 Hayfork HSA (Priority Map Values: 0-1-2-2)

The Hayfork Valley HSA includes Hayfork Creek Watershed upstream of Little Creek. Coho salmon inhabited the watershed in the past but are now thought to be extirpated.

Problems facing coho salmon in the Hayfork Valley HSA include mass wasting, erosion caused by fire, excessive stored sediment, migration barriers, low flows, lack

of pools and cover due to large-scale water diversions, water pollution and lack of high quality rearing habitat.

Recommendations for the Hayfork HSA are:

TR-HA-01 Encourage agricultural/residential water conservation programs through incentive programs.

TR-HA-02 Recommend that Trinity County amend its Critical Water Resources Overlay zone to address new riparian water rights development resulting from parcel subdivision. The amendment should include expanding the overlay zoning to additional watersheds where summer surface flows are limiting factors for residents and for coho salmon fisheries habitat.

TR-HA-03 Support continued implementation of riparian improvements through restoration activities, land use planning, and conservation easements.

7.2.6.6 HSAs with No Recommendations

Hoopa HSA (Priority Map Values: 4-2-3-2): The Hoopa HSA includes the mainstem of the Trinity River and its tributaries from the confluence with Klamath River up stream to Willow Creek.

Willow Creek HSA (Priority Map Values: 5-3-4-4): The Willow Creek HSA includes the Willow Creek watershed. Coho salmon inhabit Horse Linto Creek and first two miles of Willow Creek. Problems facing coho salmon in the Willow Creek HSA include removal of nearly all mature conifers from tributary riparian areas.

Burnt Ranch HSA (Priority Map Values: 4-4-3-3): The Burnt Ranch HSA includes the mainstem of the Trinity River and its tributaries from the South Fork confluence to the North Fork confluence.

New River HSA (Priority Map Values: 4-3-3-4): The New River HSA includes the New River watershed. Problems facing coho salmon in the New River HSA include steep terrain, mass wasting, degradation of spawning areas, erosion caused by road building and past mining practices and erosion and sediment accumulation caused by large fires.

Helena HSA (Priority Map Values: 4-5-4-4): The Helena HSA includes the mainstem of the Trinity River and its tributaries from the North Fork to Browns Creek. Problems facing coho salmon in the Helena HSA include reduced production of bottom-dwelling insects because of sediment accumulation.

Forest Glen HSA (Priority Map Values: 2-2-3-3): The Forest Glen HSA includes the South Fork Trinity River and its tributaries from Hayfork Creek up stream to the headwater of the South Fork. Problems facing coho salmon in the Forest Glen HSA

include impacts from historic mining activities, sedimentation, and low recruitment of spawning gravels.

Corral Creek HSA (Priority Map Values: 0-1-2-4): The Corral Creek HSA includes the Corral Creek watershed.

Weaver Creek HSA (Priority Map Values: 5-5-5-4): The Weaver Creek HSA includes the Weaver Creek watershed.

Upper Trinity River HSA (Priority Map Values: 0-1-2-1): The Upper Trinity HSA includes the mainstem of the Trinity River from Lewiston Dam up stream to the headwaters. Lewiston Dam is a total barrier to up and down stream migration of coho salmon.

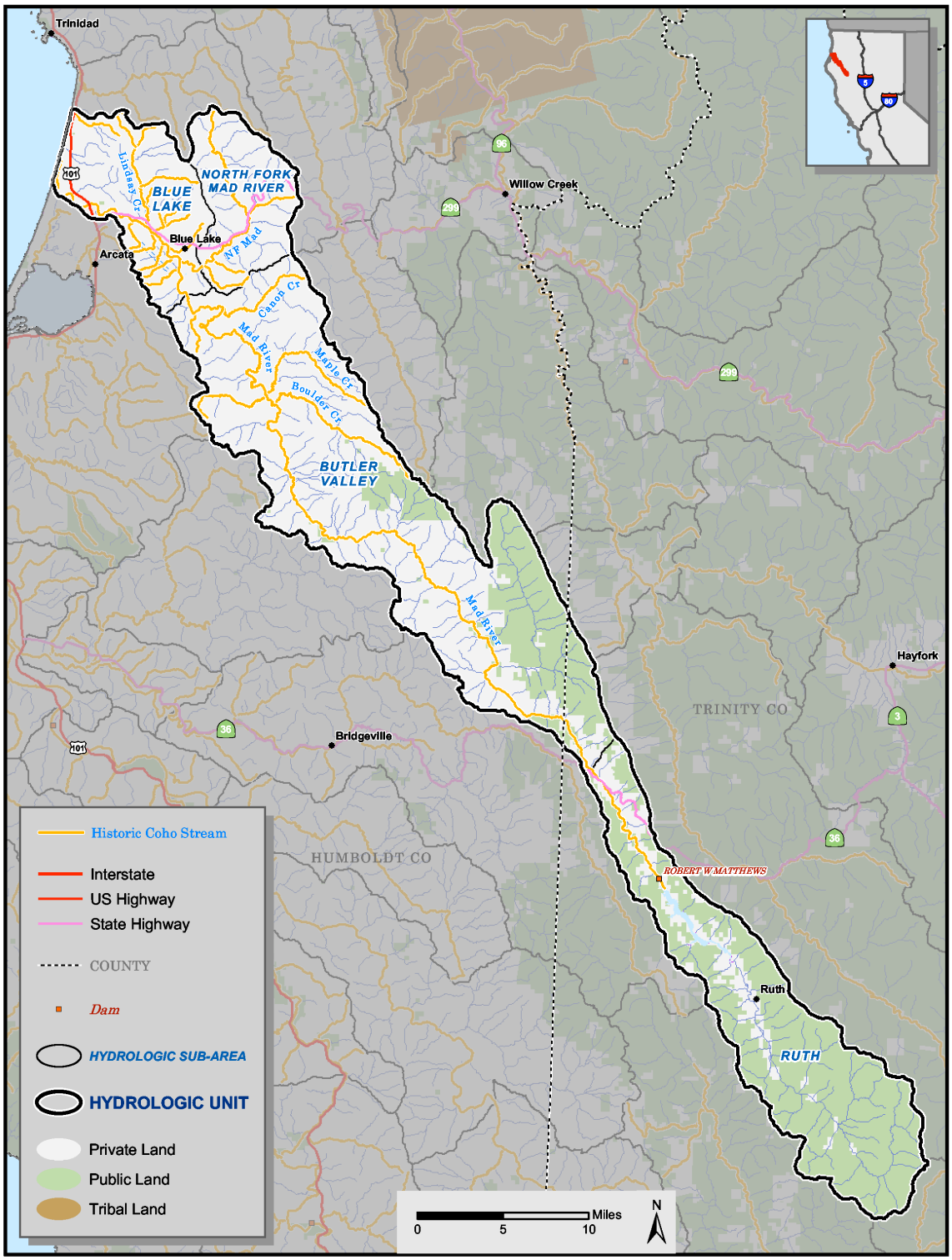
7.2.7 MAD RIVER HYDROLOGIC UNIT

The Mad River HU drains an area of approximately 318,000 acres (497 mi^2) (Figure 7-8). The Mad River basin is divided into four hydrologic subareas: Blue Lake HSA, including the estuary; North Fork HSA covering the North Fork Mad River; Butler Valley HSA for the midsection of the mainstem Mad River; and Ruth HSA, for the upper Mad River. Bureau of Land Management and the U.S. Forest Service manage 39% of the watershed. The remaining 61% of the land is in private ownership with two timber companies owning about half of the privately owned land. Gravel mining operations are located on the lower Mad, as it approaches the coastal plain.

There has been an estimated decline in Mad River coho salmon populations of at least 70% over the last 40 years. Returns of adult coho salmon at the Mad River Hatchery indicate a declining trend in this river in recent years. Important tributaries to the Mad River that support annual runs of coho salmon include Lindsay Creek in the Blue Lake HSA and Cañon Creek in the Butler Valley HSA. Juvenile coho salmon numbers in Cañon Creek have been highly variable in the recent years. Coho salmon do not appear to have been historically present in the Ruth HSA.

The Mad River is listed under the Clean Water Act Section 303(d) as impaired for sediment, turbidity, and temperature. Potential problems for coho salmon recovery in the Mad River basin include reduction in habitat diversity by aggradation and lack of conifer LWD, high fine sediment loading (in part from high road concentration in watershed), and high water temperatures throughout the basin.

FIGURE 7-8: Mad River Hydrologic Unit



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7.2.7.1 Mad River HU Recommendations

MR-HU-01 Work with landowners and other entities to reduce coho salmon tributary stream temperature through the development of mature coniferous streamside overstory within the riparian zone by continuing:

a. Planting programs in stream corridors barren of mature conifers,

b. THP review, and

c. Riparian management projects with cattle ranchers.

MR-HU-02 Recommend that the SWRCB make a high priority in this HU of the:

a. Review of authorized diversions that have no provisions to protect coho salmon, and

b. Identification of unauthorized diversions and enforcement actions to stop them.

MR-HU-03 Work with landowners and other entities to improve the quality and quantity of deep pools, spawning gravels, and cover by measures to:

a. Protect existing LWD recruitment potential through the retention of mature coniferous trees in the riparian zone, and

b. Establish adequate streamside buffer areas,

c. Increase the amount of in-channel LWD,

d. Continue to review THPs, and

e. Continue riparian management projects with ranchers.

MR-HU-04 Require the implementation of pre-project geological surveys where needed. Develop permit conditions to limit activities within unstable areas and identify mitigation measures for restoration and enhancement.

MR-HU-07 Assess barriers to passage, prioritize barriers for removal, and develop a plan to treat the barriers, with Warren Creek given a high priority for treatment.

MR-HU-08 Develop a plan to restore and maintain tributary and mainstem habitat connectivity where low flow or sediment aggradation is restricting fish passage. This is a known problem at Cañon Creek, Dry Creek, and North Fork Mad River.

MR-HU-09 Consider the mouths of Cañon Creek, Dry Creek, and North Fork Mad River as locations for a pilot project to:

a. Identify causes of loss of connectivity,

b. Evaluate management techniques,

c. Implement the identified strategy, and

d. Address permitting complexity for identified implementation measures.

MR-HU-10 Continue stream management activities with landowners in Lower Lindsay Creek.

MR-HU-11 Develop programs to control exotic vegetation, especially canary grass.

MR-HU-12 Evaluate the impact of the Mad River Hatchery steelhead production on coho salmon.

7.2.7.2 Blue Lake HSA (Priority Map Values: 5-5-4-3) and North Fork Mad HSA (Priority Map Values: 4-3-3-2)

Recommendations for the Blue Lake HSA and North Fork Mad HSA are:

MR-BL-01 Encourage landowners, municipalities, and tribal interests to work together to develop a watershed restoration plan.

MR-BL-02 Encourage agencies and land managers to work with qualified watershed groups. Develop and support well informed watershed communities with regards to coho salmon habitat issues. Ensure that there are adequate incentives for landowners who participate in activities to protect and/or restore coho salmon habitat and watershed processes. Implement an outreach program regarding issues of parity and obligations of stakeholder groups.

7.2.7.3 HSAs with No Recommendations

Two HSAs within the Mad River HU have no specific recommendations at this time.

Hydrologic Subarea	Priority Map Values
Butler Valley HSA	5-5-5-5
Ruth Lake HSA	0-1-2-0

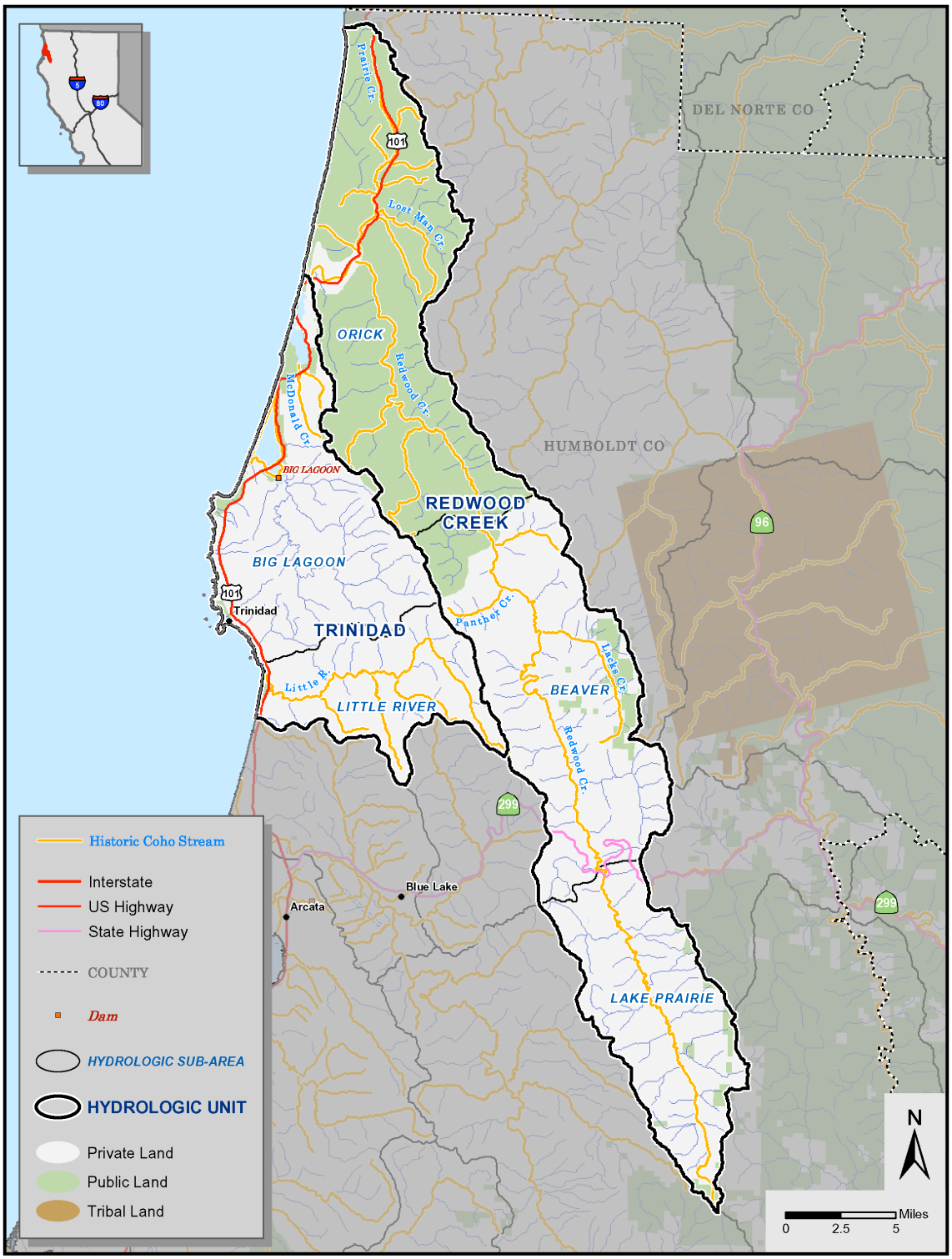
7.2.8 REDWOOD CREEK HYDROLOGIC UNIT

The Redwood Creek HU (Figure 7-9) covers an area of approximately 282 square miles. The HU is divided into three hydrologic sub-areas (HSAs): Orick HSA, containing the estuary and lower Redwood Creek; Beaver HSA, covering middle Redwood Creek from above Devil's Creek to Lupton Creek; and Lake Prairie HSA, covering upper Redwood Creek. A basin-wide assessment has been completed for Redwood Creek by the North Coast Watershed Assessment Program (Henly et al. 2002). The information from this assessment is the main source for this brief summary and for some of the recommendations.

The primary private land use activity in the Redwood Creek HU is timber production, especially in the middle and upper subbasins. Much of the lower basin is public parkland, managed for protection and restoration of the old-growth redwood forest ecosystem.

Coho salmon principally inhabit the Prairie Creek watershed and tributaries of Redwood Creek located in the Orick HSA. The numbers of coho salmon in the Prairie Creek watershed had been supplemented with hatchery fish until 1992. In addition to Prairie Creek, four other tributaries with coho salmon present in the Orick HSA include Elam, Tom McDonald, Bridge, and MacArthur Creeks, all within Redwood National and State Park (RNSP) boundaries. The historic coho salmon range includes Coyote, Panther, Lacks, Minor, Karen, Strawberry, and Pilchuck

FIGURE 7-9: Redwood Creek and Trinidad Plain Hydrologic Units



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creeks in the Beaver Creek HSA, and possibly some of the tributaries in the Lake Prairie HSA (Anderson 1988; Brown 1988; Neillands 1990; PCFWWRA 1995; Department 2001 surveys; and RNSP unpublished data).

Electro-fishing conducted in the summer of 2001 did not produce any coho salmon in Bridge, Coyote, Karen, and Pilchuck Creeks, nor in any other tributaries in the middle or upper portions of the basin that were sampled. In addition, no coho salmon were captured from the upper one third of the Redwood Creek watershed during a downstream migrant study conducted for the years 2000, 2001, or 2002 (Sparkman 2001 and pers comm. 2002).

Redwood Creek is listed under the Clean Water Act Section 303(d) as impaired for sediment and temperature. Potential problems for coho salmon recovery in the Redwood Creek basin include loss of critical habitat and periodic high temperatures in the estuary, elevated water temperatures in the mainstem and in tributaries due to lack of adequate canopy cover, reduction in habitat diversity by channel aggradation and lack of LWD, and high fine sediment loading, and high turbidity levels (in part from high road concentration in watershed).

7.2.8.1 Redwood Creek HU Recommendations

RC-HU-01 Work with Redwood National and State Parks, private landowners, and interested parties to improve fish habitat conditions of the estuary while protecting Highway 101 and the Town of Orick. These plans should aim toward restoring the historic form and function of the estuary/lagoon and slough channels, riparian forests, and adjacent wetlands. This includes providing for:

a. Unconfined channels;

b. Restoration of riparian vegetation, tree cover, wetlands, and off-channel and rearing habitat;

c. Increased sediment transport, pool depth, and LWD;

d. Work to restore natural drainage patterns from adjacent wetlands; and

e. Improving the conditions of sloughs and tributaries to the estuary (Strawberry, Dorrance and Sand Cache creeks).

RC-HU-02 Work with USACE, Redwood National and State Parks, and Humboldt County Planning Department to modify levee maintenance manuals to be consistent with habitat requirements of coho salmon.

RC-HU-04 Encourage completion of assessments of sediment sources and upgrade deficient assessments; then urge implementation of the recommendations contained in the assessment, paying particular attention to road assessment and implementation of road improvement projects; and the incorporation of measures to preclude sediment delivery to stream systems in nearstream land use planning (especially on slopes greater than 35 per cent).

RC-HU-05 Develop and implement measures to reduce water temperatures, improve the quality and quantity of deep pools, spawning gravels, and cover by protecting existing LWD recruitment potential through retention of mature trees in the riparian zone, establishing adequate near stream buffer areas protected from vegetation removal, and increasing the amount of in-channel LWD. Root wads should be left on LWD.

RC-HU-6 Coordinate a long-term, concerted effort between land owners, interested parties, and responsible agencies to determine the current population size and trends of coho salmon of Redwood Creek.

7.2.8.2 HSAs with No Recommendations

Three HSAs in the Redwood Creek HU have no specific recommendations at this time.

Hydrologic Subarea	Priority Map Values
Orick HSA	5-5-5-2
Beaver HSA	1-1-3-3
Lake Prairie HSA	0-1-2-N/A

7.2.9 TRINIDAD PLAIN HYDROLOGIC UNIT

The Trinidad HU (Figure 7-9) includes the Coastal Lagoons (Freshwater, Big, Dry, and Stone) and their tributaries, the Little River drainage, and coastal streams from Strawberry Creek north to Freshwater Lagoon. These drainages extend 10 miles inland and crest at 2,800 feet at the divide with Redwood Creek. This HU is entirely within the zone of summer fog intrusion, and so, the vegetation reflects the strong coastal influence. Timber production is the main land use activity in the HU.

Coho salmon have historically occurred in Stone Lagoon, Big Lagoon and their major tributaries as well as Little River and its tributaries and Strawberry Creek. The presence of coho salmon and other anadromous salmonids in Coastal Lagoon streams depends on the winter timing of lagoon sand bar breaches. In some years flows are not sufficient to breach the sand bars and so salmon are prevented from entering their natal streams.

Problems for coho salmon recovery in the Trinidad HU include high levels of instream fine sediment, stream channel aggradation, lack of instream LWD, insufficient levels of recruitable conifer LWD, poor estuary conditions (especially sedimentation), and existence of barriers to anadromy.

7.2.9.1 Trinidad Plain HU Recommendations

TP-HU-01 Support the assessment, prioritization, and treatment of sediment sources, particularly roads, that have not been assessed and acknowledge progress that has been made in addressing sediment sources.

TP-HU-02 Work with Humboldt County and landowners to maintain flood plain capacity and prevent future encroachment on the flood plain.

7.2.9.2 Big Lagoon HSA (Priority Map Values: 4-4-4-1)

The largest stream of the Big Lagoon HSA is Maple Creek. Coho salmon have been found in lower Maple Creek in years when the sand bar at Big Lagoon is open when returning coho salmon are in the area. Past impacts to the Maple Creek watershed include intensive logging from the 1940s through the 1960s and a large fire in 1945. The effects of historic removal of riparian overstory can still be observed in the dominance of alder canopy in several reaches.

Recommendation for the Big Lagoon HSA is:

TP-BL-01 Continue to work with private landowners to develop riparian buffers with an adequate conifer component and canopy closure to reduce temperatures, increase LWD, and provide sediment filtration.

7.2.9.3 Little River HSA (Priority Map Values: 5-4-5-5)

The drainage beyond the estuary is under the ownership of Simpson Resource Company and is undergoing second growth timber harvest through even-aged management practices. Although the current coho salmon population in the Little River drainage is depressed compared to historic estimates, numbers are believed to have been relatively stable over the last decade.

Sand bars rarely, if ever, close the mouth of Little River in the summer. While surveys indicate regular use of the Little River estuary by juvenile salmonids, habitat conditions are those of a heavily modified system. Most of the lower river channel (estuary) is confined between low levees and simplified to accommodate agricultural activities in the surrounding lands. The canopy, where present in this lower riparian zone, consists of a narrow strip of willows and some alders.

Recommendations for the Little River HSA are:

TP-LR-01 Develop a plan to improve the functioning of the lower river estuary. Reestablish conifers and a functional flood plain and riparian zone on the lower river channel. Reestablish more complex instream habitat.

TP-LR-02 Urge landowners to minimize the impacts of agricultural activities on the estuary.

TP-LR-03 Appropriate agencies should enforce any violation of law that occurred from construction of cranberry bogs in the Little River.

TP-LR-04 Work with Humboldt County and landowners to maintain current flood plain capacity and prevent future encroachment on the flood plain.

7.2.10 EUREKA PLAIN HU, HA, HSA (PRIORITY MAP VALUES: 5-5-5-5)

The Eureka Plain watershed (Figure 7-10), located on the northern coast of California 275 miles north of San Francisco, contains a rare combination of natural and social attributes. Within the basin are the ancient redwoods of the Headwaters Forest, highly productive industrial timberlands, prime agricultural lands, functioning streams and wetlands, all of which are connected to the bay, its eel grass beds, and tidal marshlands. These natural features support some of the best remaining wild salmon runs in northern California, hundreds of aquatic organisms, shorebirds, and waterfowl species, in the midst of several urban and rural communities. At least two-thirds of the total watershed is steep and heavily forested, and is primarily owned by commercial timber companies.

Humboldt Bay is the largest estuary between San Francisco and Coos Bay, Oregon. The watershed is 142,720 acres (223 mi^2) in size. Humboldt Bay, classified as a multi-watershed coastal lagoon, is separated from the ocean by long narrow sand spits and has a centrally channelized mouth to the Pacific Ocean. All of the main streams of the Eureka Plain watershed that flow into Humboldt Bay support wild populations of salmon, steelhead trout, and cutthroat trout.

A number of impairments to salmonid habitat exist in the Humboldt Bay watershed. Identified impairments include high instream sediment levels, stream channel aggradation and widening, lack of stream habitat structure (i.e., deep pools), stream water temperatures that are too high to support salmon and loss of functioning estuary habitat. Observers have seen changes in the occurrence and magnitude of flooding, and in the fish-community structure, such as avoidance of degraded tributaries by spawning adults. Simplification of the stream channels has decreased the quantity and quality of aquatic habitat. Human made obstructions to upstream and downstream migration frequently restrict access of adult and juvenile salmonids to spawning and rearing habitat. Culverts and tide gates have been identified as fish passage barriers.

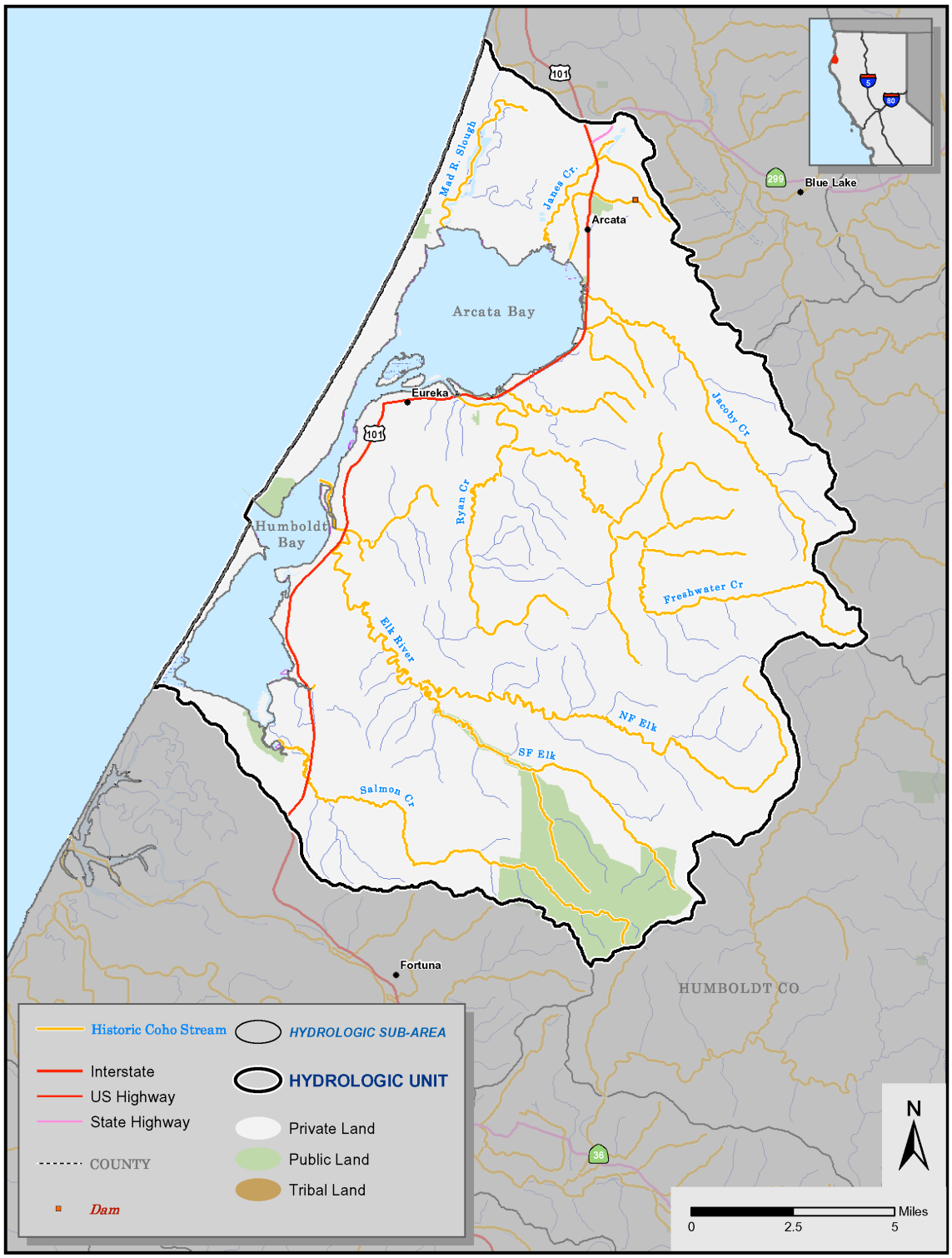
Recommendations for the Eureka Plain HU are:

EP-HU-03 In cooperation with agencies and landowners, plan to reestablish estuarine function.

EP-HU-04 Acknowledge the Arcata City Sewage Treatment Project and encourage implementation of similar projects elsewhere.

EP-HU-5 Assess sources of sediment input, prioritize and implement remediation projects.

FIGURE 7-10: Eureka Plain Hydrologic Unit



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7.2.11 EEL RIVER HYDROLOGIC UNIT

The Eel River is the third largest river system in California, encompassing approximately 2,357,760 acres (3,684 mi^2) within Humboldt, Mendocino, Trinity and Lake counties, and small portions of Colusa and Glenn counties (Figure 7-11). There are approximately 3,488 miles of streams within the Eel River watershed that contribute to a mean annual discharge of approximately six million acre-feet. Major subbasins of the Eel River system include the mainstem 945,280 acres (1,477 mi^2), North Fork 181,120 acres (283 mi^2), Middle Fork 481,920 acres (753 mi^2), South Fork 441,600 acres (690 mi^2), Van Duzen 273,920 acres (428 mi^2), and the estuary and delta 32,000 acres (50 mi^2). Other major tributaries include Kekawaka Creek, Outlet Creek, Tomki Creek, Dobbyns Creek, and Larabee Creek.

The principal features of the Eel River watershed are the rugged northwest-southeast trending ridges and canyons. The highest headwater peaks in the watershed are at elevations of 7,581 feet on Soloman Peak in Trinity County, 7,056 feet on Snow Mountain in Lake County, and 6,739 feet on Bald Mountain in Mendocino County. Three relatively flat valleys (Laytonville, Willits, and Round Valley) are located in the mountainous watershed. Lake Pillsbury is located on the mainstem, approximately 150 miles from the mouth and is 1,818 feet above sea level. Nearly flat alluvial valleys and tidal plains characterize the coastal area. Waters from the Eel River flow through its estuary to the Pacific Ocean approximately 14 miles south of the city of Eureka in Humboldt County.

The majority of the Eel River watershed is rural, with a number of small towns scattered throughout the watershed. Eighty-six percent of the Eel River watershed is held in private ownership. Presently, the most significant land uses in the watershed are timber harvest, grazing, agriculture, in-channel gravel mining, recreation, and most recently, subdivision and residential development. The Eel is part of the state's Wild and Scenic Rivers system. There are 16 segments of the Eel River that are designated *wild*, *scenic*, or *recreational* in accordance with the Wild and Scenic Rivers Act.

Records indicate coho salmon were more widespread in the Eel River basin in the past. Coho salmon were once present in the North Fork Eel River and its tributary Bluff Creek. They were also present in the Middle Fork Eel and its tributaries Rattlesnake, Mill, Grist, and Rock creeks (CDFG 1994). Coho salmon in the North Fork and Middle Fork Eel are now believed to be extirpated (Brown and Moyle 1991; CDFG 1994). Coho salmon were noticeably absent during recent surveys of many of the tributaries to the Van Duzen River, in contrast to older surveys conducted on those same streams. Similarly, recent surveys failed to find coho salmon in many of the smaller tributaries to the Eel River where coho salmon had

been reported historically. Although coho salmon were recently confirmed in many of the South Fork Eel River tributaries, there were nearly as many streams in which coho salmon were not observed.

Problems facing coho salmon in the Eel River HU include potential impacts from approximately 10,000 miles of roads in the watershed. Instream mining operations are located at number of sites in the watershed. Hydroelectric power production and water diversions also have a major impact. Scott Dam, built in 1921, is a barrier for all salmonids to the upper 29 miles of the mainstem Eel River and its tributaries. Cape Horn Dam is twelve miles below Scott Dam. As a result of these two dams, and a 9,258-foot-long tunnel just above Cape Horn Dam, an average of 160,000 acre-feet annually has been historically diverted to the Russian River drainage. Artificial fish passage barriers exist at some road crossings of streams. High summer water temperatures are common in the mainstem and many of the tributaries. The most recent stream habitat surveys conducted by the Department indicate that many of the tributary streams have low stream-habitat diversity and complexity, are lacking stream shade canopy cover, and are devoid of large woody debris recruitment. Predation by non-native fish such as the Sacramento pikeminnow may have a major impact on salmonids. The pikeminnow have displaced salmonids in summer rearing streams.

7.2.11.1 Eel River HU Recommendations

ER-HU-01 Support the existing watershed cooperative working groups and the formation of new groups where necessary.

ER-HU-03 Continue on-going efforts to provide short-term and long-term benefits to coho salmon by restoring LWD through:

a. LWD placement;

b. Management to promote conifer recruitment;

c. Improvement of existing riparian zones through plantings, release of conifers, and control of alders, blackberries, and other competitors; and incentives to landowners, such as technical support.

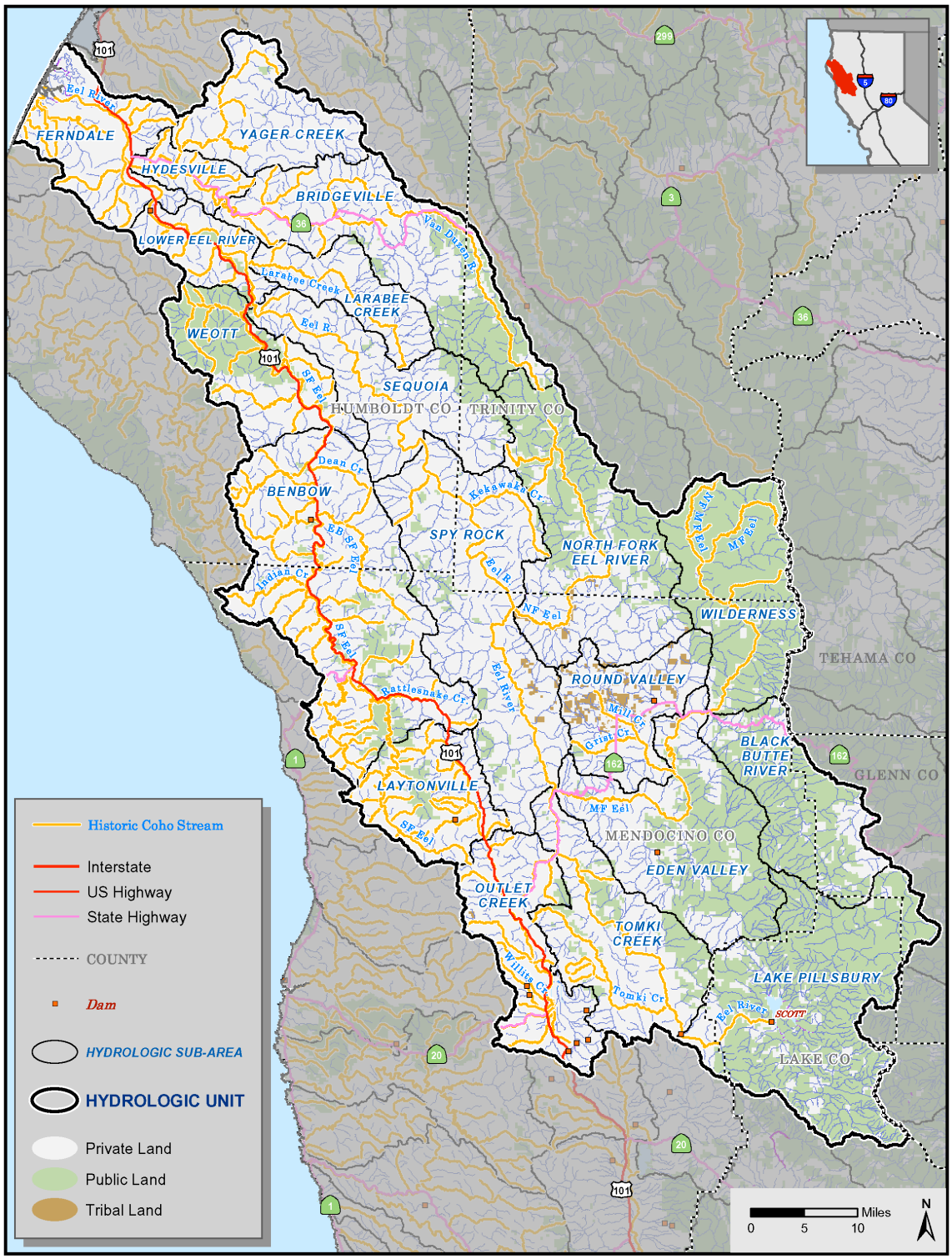
ER-HU-04 Support the assessment, prioritization, and treatment of sediment sources.

ER-HU-08 Develop a plan to restore an adequate migration corridor in the mainstem Eel River.

7.2.11.2 Ferndale HSA (Priority Map Values: 4-4-3-3)

The Ferndale HSA begins at the river mouth and extends upstream about 20 miles to the town of Rio Dell. The area includes the communities of Ferndale, Fernbridge, Loleta, Fortuna, Alton, and Rio Dell. Major land uses include dairy ranches, timber, cattle ranches, gravel mining, and residential development. Much of the land is in

FIGURE 7-11: Eel River Hydrologic Unit



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private ownership with numerous family owned and operated ranches. The Ferdale HSA includes the mainstem of the Eel River from the mouth up stream to Scotia.

Problems facing coho salmon in the Ferndale HSA include sedimentation in the estuary, an increase in the average water temperature, decreased dissolved oxygen and fewer food organisms. In addition, runoff water carrying nutrients from animal waste to the estuary degrades water quality by encouraging the growth of algae, which further reduces the dissolved oxygen levels in the estuary.

Recommendations for the Ferndale HSA are:

ER-FE-01 Encourage the Salt River Local Implementation Plan to incorporate coho salmon-friendly measures, in cooperation with the agencies. For the Salt River Local Implementation Plan to be effective, assessment prioritization and treatment of sediment sources in the watershed must be completed.

ER-FE -02 Support the acquisition of conservation easements as an incentive for landowners to conserve and enhance habitat.

7.2.11.3 South Fork Eel River HA

The South Fork Eel River HA include the Weott, Benbow and Laytonville HSAs.

Recommendation for the entire South Fork Eel River HA is:

ER-SF-01 Explore opportunities to acquire conservation easements with conditions that provide for benefits to fisheries resources.

7.2.11.4 Weott HSA (Priority Map Values: 5-5-5-4)

The Weott HSA includes the lower reaches of the South Fork Eel River and its tributaries. Problems facing coho salmon in the Weott HSA include above optimum summer water temperatures, pools below target values in quantity or quality, escape covers below target values, streambanks failing and yielding fine sediment into the stream, fine sediment entering the stream from the road system, shade canopy below target values, spawning gravel deficient in quality and/or quantity, large debris accumulations are retaining large amounts of gravel and could need modification, grazing in riparian areas and barriers to fish migration.

Recommendations for the Weott HSA are:

ER-WE-01 Support the Department of Parks and Recreation's efforts to complete the storm proofing of Bull Creek watershed.

ER-WE-02 Support the Department of Parks and Recreation and private property owners planting of trees and implement other habitat enhancement as necessary in the Bull Creek and Salmon Creek watersheds.

ER-WE-03 Request that Caltrans assess, prioritize, and treat culverts that are barriers to passage along Avenue of the Giants and Highway 101. Identify barriers to passage and prioritize them for removal, through collaborative efforts with other agencies.

7.2.11.5 Laytonville HSA (Priority Map Values: 4-5-5-5)

The Laytonville HSA includes the upper reaches of the South Fork Eel River and its tributaries.

The upper South Fork is primarily redwood forest and has good populations of coho salmon. The Ten Mile watershed is in mixed conifer forest and rangeland managed for cattle production. Coho salmon are found in Ten Mile Creek and many of its tributaries.

Problems facing coho salmon in the Laytonville HSA include above optimum summer water temperatures, pools below target values in quantity or quality, escape covers below target values, streambanks failing and yielding fine sediment into the stream, fine sediment entering the stream from the road system, shade canopy below target values, spawning gravel deficient in quality and/or quantity, large debris accumulations are retaining large amounts of gravel and could need modification, grazing in riparian areas and barriers to fish migration.

Recommendations for the Laytonville HSA are:

ER-LA-01 Support continued watershed restoration efforts, including measures to reduce temperatures in Ten-mile Creek.

ER-LA-02 Support efforts to prioritize and treat culverts on county roads that are barriers.

ER-LA-04 Support efforts by the Sheriff to enforce laws against dumping and the Department of Health to clean up dumped materials.

ER-LA-06 Encourage cities, counties, and Caltrans to adopt maintenance manuals that protect coho salmon habitat (e.g., standards for sidecasting of spoils and identification of spoils disposal sites).

7.2.11.6 Outlet Creek HSA (Priority Map Values: 5-5-5-4)

Outlet Creek HSA includes the Outlet Creek watershed, a tributary to the upper mainstem of the Eel River. One of the longest migrating populations of coho salmon in California is found in the upper tributaries of Outlet Creek. Coho salmon have recently been observed in the tributaries to Little Lake Valley including Ryan, Willits, Baechtol, Broaddus and Mill Creeks. Many of these tributaries run through the City of Willits.

Problems facing coho salmon in the Outlet Creek HSA include above-optimum summer water temperatures, pools below target values in water quantity or quality, escape covers below target values, streambanks failing and yielding fine sediment into the stream, fine sediment entering the stream from the road system, shade canopy below target values, spawning gravel deficient in quality and/or quantity, grazing in riparian areas, and barriers to fish migration.

Recommendations for the Outlet Creek HSA are:

ER-OC-01 Prepare a technical assessment of Outlet Creek watershed, develop recommendations to restore long-term function, and prioritize implementation.

ER-OC-02 Encourage the City of Willits to become involved in planning for coho salmon recovery and to:

a. Assess, prioritize, and treat barriers to passage;

b. Address water quality issues;

c. Modify facility maintenance practices as necessary; and

d. Evaluate land use planning and revise plans as appropriate.

7.2.11.7 HSAs with No Recommendations

Scotia HSA (Priority Map Values: 2-2-3-4): The Scotia HSA includes tributaries to the Eel River from the town of Scotia to Dyerville where the South Fork Eel River enters the Mainstem Eel River. This HSA is sparsely populated, with residents from several small towns including Pepperwood, Holmes, Shively and Redcrest. Small farming operations exist in the Eel River floodplain of these communities. Much of this HSA is owned by the Pacific Lumber Company and is managed for timber production under the conditions of their Habitat Conservation Plan. The Scotia HSA also includes streams managed by Humboldt Redwoods State Park.

Problems facing coho salmon in the Scotia HSA include above optimum summer water temperatures, pools below target values in quantity or quality, escape covers below target values, streambanks failing and yielding fine sediment into the stream, fine sediment entering the stream from the road system, shade canopy below target values, spawning gravel deficient in quality and/or quantity, large debris accumulations are retaining large amounts of gravel and could need modification, grazing in riparian areas and barriers to fish migration.

Benbow HSA (Priority Map Values: 5-5-5-5): The Benbow HSA includes the middle reaches of the South Fork Eel River and its tributaries. Problems facing coho salmon in the Benbow HSA include above optimum summer water temperatures, pools below target values in quantity or quality, escape covers below target values, streambanks failing and yielding fine sediment into the stream, fine sediment entering the stream from the road system, shade canopy below target values,

spawning gravel deficient in quality and/or quantity, large debris accumulations are retaining large amounts of gravel and could need modification, grazing in riparian areas and barriers to fish migration.

Larabee Creek HSA (Priority Map Values: 1-1-2-1): The Larabee Creek HSA includes the Larabee Creek watershed, a tributary to the lower mainstem of the Eel River. The Larabee Creek watershed is owned by the Pacific Lumber Company and numerous private ranches that manage their land for timber production and livestock grazing under a Habitat Conservation Plan.

Hydesville HSA (Priority Map Values: 4-4-4-3): The Hydesville HSA consists of the lower mainstem Van Duzen River and its lower tributaries. Much of this area is in private ownership and managed for beef or dairy cattle production, residential use, gravel mining and timber production in the upland areas. The tributaries in the Hydesville HSA have good potential for supporting coho salmon. However, no coho salmon have been found in recent surveys.

Problems facing coho salmon in the Hydesville HSA include above optimum summer water temperatures, pools below target values in quantity or quality, escape covers below target values, streambanks failing and yielding fine sediment into the stream, fine sediment entering the stream from the road system, shade canopy below target values, spawning gravel deficient in quality and/or quantity, large debris accumulations are retaining large amounts of gravel and could need modification, and grazing in riparian areas.

Bridgeville HSA (Priority Map Values: 4-5-4-1): The Bridgeville HSA includes the Upper Van Duzen River and its tributaries. This lower reach of the Van Duzen mainstem and associated tributaries support steelhead and Chinook salmon, but no coho salmon have been observed in recent surveys.

Problems facing coho salmon in the Bridgeville HSA include above optimum summer water temperatures, pools below target values in water quantity or quality, escape covers below target values, streambanks failing and yielding fine sediment into the stream, fine sediment entering the stream from the road system, shade canopy below target values, spawning gravel deficient in quality and/or quantity, large debris accumulations are retaining large amounts of gravel and could need modification, grazing in riparian areas, and barriers to fish migration.

Yager Creek HSA (Priority Map Values: 4-3-3-3): The Yager Creek HSA includes the middle and upper Yager Creek watersheds. Yager Creek is a tributary to the Van Duzen River. The lower portion of Yager Creek is owned by the Pacific Lumber Company and managed for timber production under a Habitat Conservation Plan.

The upper portion of Yager Creek is in private ownership and managed for timber and livestock production.

Most of Yager Creek is characterized by high water temperatures and little canopy, making it unsuitable as coho salmon habitat. In this HSA most of the potential coho salmon habitat is in tributaries to Yager Creek, including Cooper Mill Creek, Blanton Creek, Lawrence Creek, and its tributary Shaw Creek.

Problems facing coho salmon in the Yager Creek HSA include above optimum summer water temperatures, pools below target values in water quantity or quality, escape covers below target values, streambanks failing and yielding fine sediment into the stream, fine sediment entering the stream from the road system, shade canopy below target values, spawning gravel deficient in quality and/or quantity, large debris accumulations that retain large amounts of gravel and could need modification, and barriers to fish migration.

Sequoia HSA (Priority Map Values: 1-1-2-1): The Sequoia HSA includes the mainstem of the Eel River from the confluence of the South Fork up stream to the Spy Rock HSA. The Sequoia Creek HSA supports steelhead and Chinook salmon but no coho salmon have been observed in recent surveys.

Spy Rock HSA (Priority Map Values: 1-1-2-1): The Spy Rock HSA includes the mainstem of the Eel River from the Sequoia HSA up stream to the confluence of the Middle Fork. The Spy Rock HSA supports steelhead and Chinook salmon but no coho salmon have been identified in recent surveys.

North Fork Eel River HSA (Priority Map Values: 1-1-1-N/A): North Fork of the Eel River HSA includes the entire North Fork Eel River watershed. Coho salmon are thought to be extirpated from the North Fork HSA.

Tomki Creek HSA (Priority Map Values: 1-1-2-1): The Tomki Creek HSA includes the upper mainstem of the Eel River from the confluence of the Middle fork up to the Lake Pillsbury HSA and includes the Tomki Creek watershed. No coho salmon have been observed in Tomki Creek or any of its tributaries in recent surveys

Lake Pillsbury HSA (Priority Map Values: 0-1-1-1): The Lake Pillsbury HSA includes the upper mainstem Eel River watershed.

Eden Valley HSA (Priority Map Values: 1-1-2-1): The Eden Valley HSA includes the lower mainstem of the Middle Fork Eel River. Coho salmon in the Eden Valley HSA are believed to be extirpated.

Round Valley HSA (Priority Map Values: 0-1-2-1): The Round Valley HSA includes the Mill Creek watershed, a tributary to the Middle Fork of the Eel River. Coho salmon in the Round Valley HSA are believed to be extirpated. Problems facing coho salmon in the Round Valley HSA include above optimum summer water temperatures, pools below target values in quantity or quality, escape covers below target values, streambanks failing and yielding fine sediment into the stream, fine sediment entering the stream from the road system, shade canopy below target values, spawning gravel deficient in quality and/or quantity, large debris accumulations are retaining large amounts of gravel and could need modification, and grazing in riparian areas.

Black Butte River HSA (Priority Map Values: 0-1-1-1): The Black Butte River HSA includes the Black Butte River watershed, a headwater tributary to the Middle Fork Eel River. Coho salmon in the Black Butte River HSA are believed to be extirpated.

Wilderness HSA (Priority Map Values: 0-1-1-1): The Wilderness HSA includes the headwaters of the Middle Fork Eel River up stream from the confluence of the Black Butte River. Coho salmon in the Wilderness HSA are believed to be extirpated.

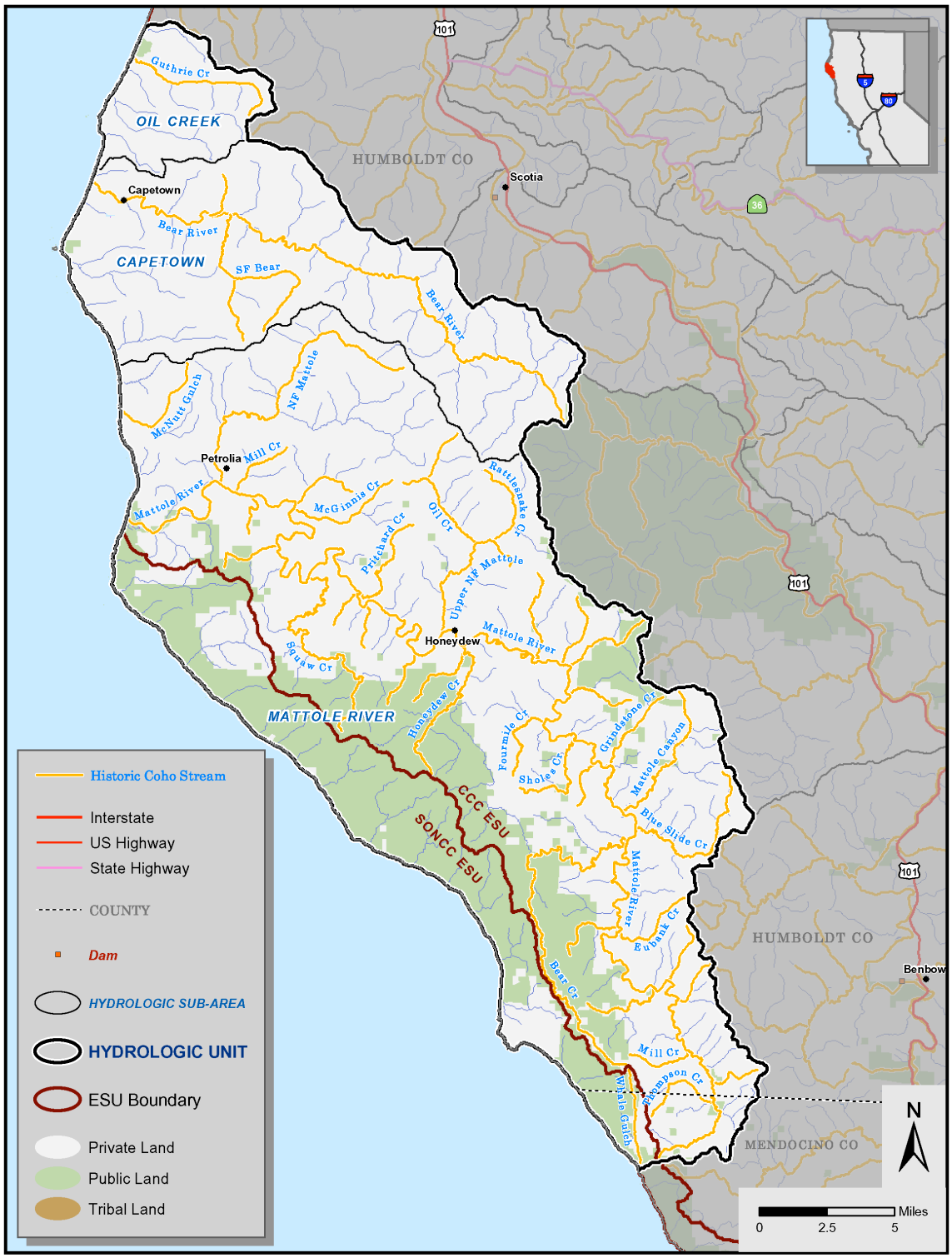
7.2.12 CAPE MENDOCINO HYDROLOGIC UNIT

The Cape Mendocino HU (Figure 7-12) encompasses approximately 247,680 acres (387 mi^2) of the northern California Coast Range and includes three watersheds: the Mattole River in the Mattole River HSA, Bear River in the Capetown HSA, and Oil Creek in the Oil Creek HSA.

The information regarding land use and coho salmon presence for the Mattole River HSA is presented in Section 7.2.12.1 below. The Bear River and Oil Creek watersheds are entirely privately owned and are managed for timber production and rangeland. In 1996 and 2000, the Department surveyed most tributaries to Bear River. These surveys have documented suitable coho salmon habitat within several portions of the Bear River including portions of the South Fork Bear River, but presence of coho salmon has not been documented. The presence of steelhead and Chinook salmon in the Bear River watershed has been documented by the Department as recently as June 13, 2001. There was one record of a young-of-the-year coho salmon in Oil Creek in 1994 (D. Halligan, personal communication), but the drainage has not been subject to regular surveys.

Problems for coho salmon recovery in the Cape Mendocino HU as a whole are deleterious summer water temperatures; high levels of fine sediment; and lack of deep pools, cover, other elements of habitat complexity; and suitable spawning gravels.

FIGURE 7-12: Cape Mendocino Hydrologic Unit



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7.2.12.1 Recommendation for the Cape Mendocino HU

CM-HU-01 Encourage the placement of LWD in stream channels to improve channel structure and function.

7.2.12.2 Mattole River HSA (Priority Map Values for SONCC portion: 4-5-5-5; Priority Map Values for CCC portion: 1-2-3-5)

A small portion of the Mattole River's southern-most headwaters originate in Mendocino County, but the vast majority of the basin is within Humboldt County. The Mainstem Mattole is approximately 62 miles long, and receives water from over 74 tributary streams. There are over 600 perennial stream miles in these watersheds.

A basin-wide assessment has been completed for the Mattole River by the North Coast Watershed Assessment Program (Downie et al. 2002). The Mattole River watershed was divided into 5 subbasins (Northern, Eastern, Southern, Western and the Estuary) in the watershed assessment and this recovery strategy uses the same organization. The Estuary located at the mouth of the Mattole River in comparison to the other subbasins is quite small, but important to salmonids throughout the summer months, being a vital transition step on the seaward migration of juveniles and the returning adult spawners. Although no specific recommendations were made for the Estuary subbasin, estuary sedimentation problems would be improved by continuing the basin-wide road and erosion assessments and implementation of the resulting recommendations.

Land use activities in the Mattole River HSA include timber production, ranching, crop farming, and residential subdivision. Human activities such as road construction, grazing of livestock, and timber management, have interacted with natural geologic instability and sediment production, and major storm events (e.g., the 1964 flood) to impact aquatic habitats. Disturbances from an increasing human population include water diversions, conversion of near stream areas to residential usage, removal of large, mature vegetation, widespread soil disturbance, construction of levees or armored banks, and the installation of dams and reservoirs that disrupt normal flow regimes and prevent free movement of salmonids and other fish.

Problems for coho salmon recovery in all subbasins in the Mattole River HSA include high instream sediment levels; stream channel aggradation and widening; low flow conditions, lack of habitat complexity such as deep pools; excessive water temperatures; and loss of functioning estuarine habitat.

Southern Subbasin of the Mattole River: The Southern Subbasin of the Mattole River is located south of Bridge Creek (River Mile 52.1) and McKee Creek (River Mile 52.8), near Thorn Junction, and continues upstream to the Mattole headwaters near

Four Corners (River Mile 61.5), a distance along the mainstem Mattole of about 9.4 river miles. The subbasin is largely managed for timber production and cattle ranching. Recent stream surveys indicate the presence of coho salmon and steelhead trout throughout the Southern Subbasin. This subbasin supports coho salmon in more tributaries than the other Mattole subbasins.

Recommendations for the Southern Subbasin are:

CM-MS-01 Encourage elimination of unnecessary and wasteful use of water to improve stream surface flows and coho salmon habitat through outreach and education of water and conservation practices. Include in outreach and education sections of recovery plan.

CM-MS-03 Promote a cooperative effort to establish monitoring stations at appropriate locations to monitor in-channel sediment (or turbidity) both in the lower basin and in the lower reaches of major tributaries.

CM-MS-06 Follow the NCRWQCB suggested Best Management Practices (BMPs) to protect water quality from the ground application of pesticides.

CM-MS-09 Request that Mendocino County investigate promoting cluster development away from streams to protect coho salmon.

CM-MS-11 Develop educational materials for landowners explaining how they can protect coho salmon.

CM-MS-12 Request that the SWRCB begin the process of declaring the Southern Subbasin to be fully appropriated in the spring and summer.

CM-MS-15 Encourage the planting of trees in riparian areas where conditions are suitable.

Western Subbasin of the Mattole River: The Western Subbasin of the Mattole is located between the Little Bear Creek in the estuary (River Mile 0.3) and the headwaters of the South Fork of Bear Creek (River Mile 50) along the western side of the Mattole mainstem and Wilder Ridge for a distance of about sixty miles. The watershed is largely managed for conservation and recreation in the King Range National Conservation Area. Recent surveys indicate the presence of coho salmon in a few tributaries and the presence of steelhead throughout. Instream habitat is showing signs of improvement due, in part, to the efforts of local stewardship.

Recommendations for the Western Subbasin are:

CM-MW-03 Support the assessment, prioritization, and treatment of sources of excess sediment.

CM-MW-04 Encourage the monitoring of summer water and air temperatures using Department-accepted protocols. Continue temperature monitoring efforts in Stansberry, Mill (RM 2.8) Clear, Squaw, Woods, Honeydew Bear, North Fork Bear, South Fork Bear, Little Finley, Big Finley, and Nooning creeks, and expand efforts into other subbasin tributaries.

CM-MW-06 Encourage the assessment, prioritization, reclamation and enhancement of riparian habitat.

CM-MW-07 Recognize and support on-going efforts of landowners, BLM, and others to improve habitat conditions for coho salmon.

CM-MW-09 Conduct a public education program to raise awareness of the habitat needs of coho salmon and how the community, especially landowners, can improve coho salmon habitat.

CM-MW-10 Develop incentives for landowners and communities to reduce summer water withdrawals and enhance habitat.

CM-MW-12 Support a plan for mapping unstable soils and use of the information to guide land-use decisions, road design, and other activities that can increase erosion.

Northern Subbasin of the Mattole: The Northern Subbasin of the Mattole is located between the Estuary and Honeydew Creek (River Mile 26.5) along the northeastern side of the Mattole mainstem. Eighteen perennial streams drain a watershed area of 62,720 acres (98 mi^2). The watershed is largely managed for timber production and cattle ranching. The town of Petrolia is located in this subbasin at the confluence of the North Fork Mattole River and the Mattole River. Several back-to-land homesteads are located near Petrolia. Controversies concerning old-growth timber harvest issues are focused on Rainbow and Long ridges in this subbasin.

The Northern Subbasin appears to be the most impacted of the Mattole subbasins from a combination of naturally occurring geological processes and land use activities. Although historical accounts indicate stream conditions were favorable for salmonid populations in the past, coho salmon were not found in the eight tributaries surveyed by the Department in 2001 or 2002.

Recommendations for the Northern Subbasin:

CM-MN-01 Encourage tree planting and other vegetation management to improve canopy cover, especially in Conklin, Oil, Green Ridge, Devils, and Rattlesnake Creeks.

CM-MN-02 Encourage cooperative efforts for treatment of stream bank erosion sites to reduce sediment yield to streams, especially in Sulphur Creek, Conklin Creek, Oil Creek, and the lower reaches of the North Fork Mattole River.

CM-MN-03 Due to high incidence of unstable slopes in this subbasin, any permitting of future sub-division development proposals should be based on existing county-imposed forty acre minimum parcel sub-division ordinances.

Eastern Subbasin of the Mattole: The Eastern Subbasin of the Mattole is located between Honeydew Creek (River Mile 26.5) and Bridge Creek (River Mile 52.1) along the eastern side of Wilder Ridge, and the Mattole mainstem above Bear Creek,

for a distance of about 25.6 river miles. The watershed is largely managed for timber production and cattle ranching. Recent biological stream surveys indicate the presence of coho salmon in a few tributaries and steelhead throughout the Eastern Subbasin.

Recommendations for Eastern Subbasin:

CM-ME-01 Continue to conduct and implement road and erosion assessments, especially in Middle, Westlund, Gilham, Sholes, Blue Slide, and Fire creeks.

CM-ME-02 Encourage tree planting and other vegetation management to improve canopy cover, especially in Dry and Blue Slide creeks.

CM-ME-03 Encourage cooperation at stream bank erosion sites to reduce sediment yield to streams, especially in Middle, Westlund, Gilham, North Fork Fourmile, Sholes, Harrow, Little Grindstone, Grindstone, Eubank, and McKee creeks.

7.2.12.3 HSAs With No Recommendations

Hydrologic Subarea	Priority Map Values
Capetown HSA	1-1-2-5
Oil Creek HSA	0-1-2-5

7.3 CENTRAL CALIFORNIA COAST ESU

The Department's (CDFG 2002) status review concluded that state *Endangered* listing of the CCC coho ESU was warranted. Recent survey data indicate that widespread extirpation has already occurred within some of the larger stream systems (e.g., Gualala and Russian Rivers) or over broad geographical areas (e.g., Sonoma County Coast, San Francisco Bay tributaries, streams south of San Francisco). Coho salmon populations at the northern end of this ESU seem to be relatively stable or are not declining as rapidly as those to the south. However, the southern portion, where widespread extirpation and near extinctions have occurred, is a major and significant portion of the range of coho salmon in this ESU. Small population size, along with large-scale fragmentation and collapse of range in this area indicate that CCC coho salmon are in serious danger of extinction throughout all or a significant portion of their range. The Department, in consultation with the CRT, has identified the following protection and management actions intended to reverse the decline of coho salmon.

7.3.1 MENDOCINO COAST HYDROLOGIC UNIT

The Mendocino Coast HU (Figures 7-13 and 7-14) is comprised of the coastal watersheds in Mendocino and Sonoma counties that are west and south of the Eel and Mattole basins, and west and north of the Russian River basin. The larger river basins in the HU include Ten Mile River, Noyo River, Big River, Albion River, Navarro

FIGURE 7-13: Mendocino Coast Hydrologic Unit (North)

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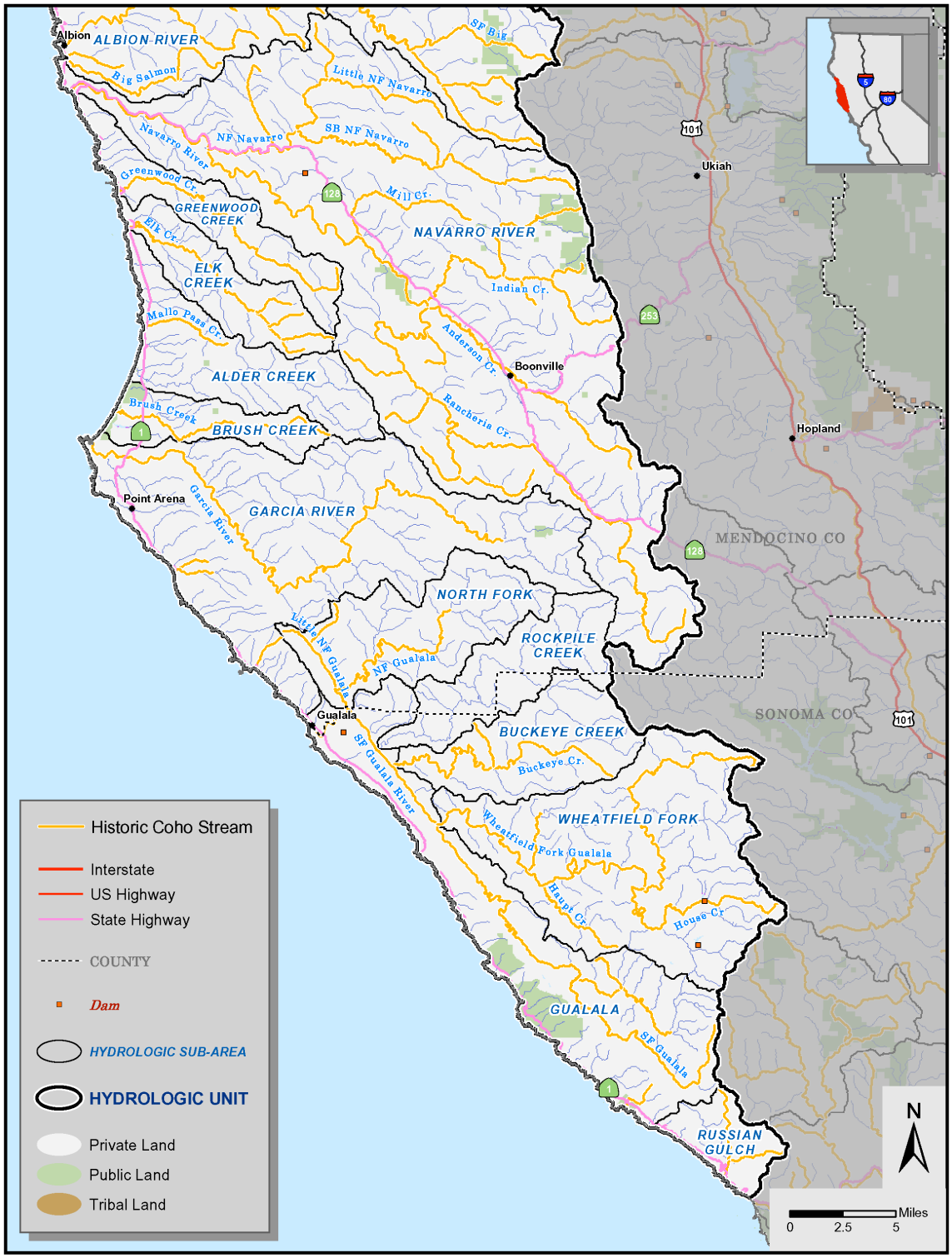
FIGURE 7-14: Mendocino Coast Hydrologic Unit (South)



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River, Garcia River, and Gualala River. Also included are numerous smaller streams draining directly to the Pacific Ocean. Total area of the HU is about 1.02 million acres, or 1,600 square miles. On the coast, air temperatures generally range from the high 30's to high 50's (ºF) in winter, and from the low 50's to high 60's (ºF) in summer. Average annual precipitation is about 40 inches on the coast and can be significantly higher on inland hill slopes. The HU lies totally within the federally designated Central California Coast Evolutionarily Significant Unit (CCC-ESU) for coho salmon. The Department operates the Noyo River Salmon Egg Collecting Station on the South Fork Noyo River. Adult coho salmon are trapped and spawned and the resulting eggs and young fish are reared at Mad River Hatchery in Humboldt County.

Historically, coho salmon populations in the main river systems within this HU, such as the Albion, Ten Mile, Big, Noyo (including hatchery supplementation), Navarro, Garcia, and Gualala rivers, have been estimated by the Department to be in the thousands during the 1960s. Recent presence surveys have been undertaken in an effort to determine where coho salmon may still persist.

The most common land use in this HU is timber production, although grazing (cattle and sheep), irrigated agriculture (orchards, vineyards), parks (mainly California state parks), rural subdivisions, and urban areas also occupy smaller portions of the area.

Though water quality characteristics in the HU are generally adequate for salmonids there remain several problems facing salmonid survival. Several major stream systems in the Mendocino Coast region are presently on the Regional Water Quality Board 303(d) list for sedimentation or siltation. High summer water temperatures are the most identifiable problem limiting distribution of coho salmon in some streams. None of the major streams have mainstem dams blocking large portions of salmonid habitat; however, man-made barriers to migration do exist, caused mainly by culverts designed and placed with insufficient consideration of fish passage. The lack of instream shelter (especially large woody debris) as well as water diversions and illegal harvest may also limit production of coho salmon within the Unit.

7.3.1.1 Mendocino Coast HU Recommendations

MC-HU-04 Encourage Mendocino and Sonoma counties to adopt county grading ordinances.

MC-HU-07 Support the assessment, prioritization, and treatment of sediment sources at an HSA level.

MC-HU-09 Map unstable soils and use that information to guide land-use decisions, road design, THPs, and other activities that can promote erosion.

MC-HU-11 Improve pool frequency and depth by actions to:

a. Increase scale and efficiency of LWD improvement efforts;

b. Continue to treat existing upslope sediment sources;

c. Avoid creating new sources (e.g., road crossings); and

d. Avoid or minimize land ownership fragmentation/conversion to more intensive uses.

MC-HU-12 Discourage poaching of coho salmon by measures to:

a. Cooperate with and provide incentives to landowners to maintain road and trail closures to be effective against trespass;

b. Encourage monitoring of road closures and timely repair of defective or damaged road closure systems;

c. Promote CALTIP, especially how it might apply to spawning coho salmon; and

d. Report un-permitted road use to local, state, and federal enforcement personnel during periods when coho salmon are running.

MC-HU-14 Supplement on-going efforts to provide short-term and long-term benefits to coho salmon by restoring LWD and shade through:

a. LWD placement;

b. Management to promote conifer recruitment;

c. Improvement of existing riparian zones through plantings, release of conifers, and control of alders, blackberries, and other competitors;

d. Incentives to landowners, such as technical support.

MC-HU-16 The Department, SWRCB, RWQCB, CDF, Caltrans, and counties, in cooperation with NOAA Fisheries, should evaluate the rate and volume of water drafting for dust control in streams or tributaries and where appropriate, minimize water withdrawals that could impact coho salmon. These agencies should consider existing regulations or other mechanisms when evaluating alternatives to water as a dust palliative (including EPA-certified compounds) that are consistent with maintaining or improving water quality.

MC-HU-18 Coordinate with the North Coast Regional Water Quality Control Board (NCRWQCB) to implement water quality monitoring and streamline permitting of coho salmon habitat restoration projects (RWQCB 401, USACE 404, NOAA Fisheries, and USFWS permitting).

MC-HU-20 Decrease coarse sediment delivery by implementing actions to work with:

a. Landowners, other resource professionals, and agencies to identify areas of increased risk of mass wasting to enable avoidance or mitigation of triggering activities; and

b. Transportation system (state, county, and private road and rail) construction and maintenance personnel to identify risks and mitigation measures for mass wasting such as: replacing culverts with bridges, minimizing fill volumes on culverts, and constructing critical dips at culverts.

MC-HU-21 Decrease fine sediment loads by actions to:

a. Abandon riparian road systems and/or upgrade roads and skid trails that deliver sediment to adjacent water courses;

b. Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses;

c. Minimize the density of road and trail crossings of water courses;

d. Encourage out-sloping roads with rolling dips as the standard, wherever feasible, for all roads, and especially unsurfaced roads; and

e. Work with landowners to identify and modify practices such as road maintenance that generate fine sediment.

7.3.1.2 Albion River HSA (Priority Map Values: 5-5-5-4)

The Albion River HSA consists of the Albion River, all its tributary streams and several adjacent streams draining directly to the Pacific Ocean. Watershed area is 43,791 acres, or 68 square miles. Main Albion River tributary streams include Railroad Gulch, South Fork Albion River, and Marsh Creek. Important adjacent streams include Little River and Salmon Creek. During recent surveys (2000 – 2002), coho salmon have been found consistently in the Albion River and many of its tributaries, as well as the Little River, Little Salmon Creek and Big Salmon Creek.

Recommendations for the Albion River HSA are:

MC-AR-01 Place instream structures to improve gravel retention and habitat complexity.

MC-AR-02 Provide technical assistance and incentives to landowners in developing and implementing sediment reduction plans to meet requirements of the Clean Water Act TMDL. Make watersheds with an implementation schedule the highest priority.

MC-AR-04 Supplement on-going efforts to provide short-term and long-term benefits to coho salmon by restoring LWD and shade through:

a. LWD placement;

b. Management to promote conifer recruitment;

c. Improvement of existing riparian zones through plantings, release of conifers, and control of alders, blackberries, and other competitors; and

d. Incentives to landowners, such as technical support.

MC-AR-06 After genetic analysis, consider Albion River coho salmon for use as broodstock for reestablishing coho salmon populations in other Mendocino coastal streams.

MC-AR-12 Conduct comprehensive sub basin erosion control “storm proofing” combined with installation of LWD into streams.

MC-AR-13 Modify stream barriers to allow fish passage while maintaining LWD.

7.3.1.3 Big River HSA (Priority Map Values: 5-4-4-4)

The Big River HSA consists of Big River, all its tributary streams, and several adjacent streams draining directly to the Pacific Ocean. Watershed area is 128,423 acres, or 201 square miles. Main Big River tributaries include Two Log Creek, North Fork Big River, Martin Creek, Rice Creek, South Fork Big River, and Daugherty Creek. Important adjacent streams include Caspar Creek and Russian Gulch. During recent surveys (2000 – 2002), coho salmon have shown consistent presence in Caspar Creek and have been found less consistently in Doyle Creek, Russian Gluch, and the Big River and its tributaries.

Recommendations for the Big River HSA are:

MC-BR-01 To minimize and reduce the effects of water diversions, take actions to improve State Water Resources Control Board (SWRCB) coordination with other agencies to address season of diversion, off-stream reservoirs, bypass flows protective of coho salmon and other anadromous salmonids and natural hydrograph, and avoidance of adverse impacts caused by water diversion, including funding of assessment and GIS mapping of water diversions and determination and monitoring of Fish and Game Code Section 1600 Program compliance related to water diversions.

MC-BR-02 Target Big River for enhancement of instream habitat by installation of LWD.

7.3.1.4 Garcia River HSA (Priority Map Values: 4-4-4-5)

The Garcia River HSA consists of the Garcia River, all its tributary streams, and also several smaller streams west of the Garcia basin that drain directly to the Pacific Ocean. Watershed area is 93,725 acres, or 146 square miles. The main Garcia River tributaries include Hathaway Creek, North Fork Garcia River, South Fork Garcia, Signal Creek, and Inman Creek. Streams draining directly to the Pacific Ocean include Schooner Gulch and Fish Rock Gulch. During recent surveys (2000 – 2002), coho salmon have been found only in 2002 in the North Fork Garcia River as well as the South Fork Garcia River and its tributary, Fleming Creek.

Recommendations for the Garcia River HSA are:

MC-GA-01 Acknowledge that a comprehensive approach to watershed planning is best.

MC-GA-02 Reestablish connectivity of North Fork Garcia to the mainstem.

MC-GA-05 Provide technical assistance and incentives to Garcia River landowners for developing and implementing sediment reduction plans to meet the requirements of the Clean Water Act TMDL.

MC-GA-06 Utilize as a model for erosion reduction and LWD placement the comprehensive approach practiced in the South Fork of the Garcia.

7.3.1.5 Navarro River HSA (Priority Map Values: 5-5-4-3)

The Navarro River HSA consists of the Navarro River and all its tributary streams. Watershed area is 202,100 acres, or 316 square miles. Main tributaries include North Fork Navarro River, Mill Creek, Indian Creek, Rancheria Creek, and Anderson Creek. The Navarro is the largest and most diverse basin in the HU. Land uses include timber production near the coast, irrigated agriculture in Anderson Valley, and grazing on hill slopes of the eastern area. Melange geology in the eastern areas makes them less stable than coastal areas dominated by coastal belt geology. During recent surveys (2000 – 2002), coho salmon have been found in 2002 and 2003 in the Navarro River and in all three years in some of its tributaries, including Marsh Gulch, Myrray Gulch, Flume Gulch, Flynn Creek, and North Branch North Fork Navarro River.

Recommendations for the Navarro River HSA are:

MC-NA-04 Supplement on-going efforts to provide short-term and long-term benefits to coho salmon by restoring LWD and shade through:

a. LWD placement;

b. Management to promote conifer recruitment;

c. Improvement of existing riparian zones through plantings, release of conifers, and control of alders, blackberries, and other competitors; and

d. Incentives to landowners, such as technical support.

MC-NA-08 Provide technical assistance and incentives to Navarro River landowners for developing and implementing sediment reduction plans to meet the requirements of the Clean Water Act TMDL.

7.3.1.6 Noyo River HSA (Priority Map Values: 5-4-4-4)

The Noyo River HSA consists of the Noyo River, all its tributary streams, and several adjacent smaller streams draining directly to the Pacific Ocean. Watershed area is 106,260 acres, or 166 square miles. The main Noyo River tributaries include South Fork Noyo and North Fork Noyo. The more important adjacent streams include Pudding Creek and Hare Creek. During recent surveys (2000 – 2002), the Noyo River and many of its tributaries, as well as Pudding Creek and Hare Creek have shown consistent presence of coho salmon.

The recommendation for the Noyo River HSA is:

MC-NO-04 Request that Mendocino County implement a sediment reduction plan related to water quality.

7.3.1.7 Ten Mile River HSA (Priority Map Values: 4-4-4-4)

The Ten Mile River HSA consists of the Ten Mile River, all its tributary streams, and several small adjacent streams draining directly to the Pacific Ocean. Watershed area is 82,543 acres, or 129 square miles. The main tributaries include North Fork Ten Mile, Middle Fork (also known as Clark Fork) Ten Mile, and South Fork Ten Mile. The Ten Mile River originates in the Coast Range of Mendocino County. Its main tributaries are the North and South Forks. It enters the ocean about nine miles north of Fort Bragg. The Ten Mile River flows mainly through coastal forests and grasslands. During recent surveys (2000 – 2002), coho salmon have been found only in 2001 and 2002 in the Ten Mile River and most of its tributaries, although some of the tributaries such as Little North Fork Ten Mile River and Bear Haven Creek have had coho salmon present in all three years.

The recommendation for the Ten Mile River HSA is:

MC-TM-5 Provide technical assistance and incentives to Ten Mile River landowners for developing and implementing sediment reduction plans to meet the requirements of the Clean Water Act TMDL.

7.3.1.8 HSAs with No Recommendations

Gualala River HSA (Priority Map Values: 1-3-2-5): This HSA consist of the Gualala River and all its tributary streams. Watershed area is 222,399 acres, or 347 square miles. The main Gualala River tributaries include North Fork Gualala, Little North Fork Gualala, Rockpile Creek, South Fork Gualala, Buckeye Creek, Wheatfield Fork Gualala River, and Sproule Creek. The Gualala River begins on the western slope of the coastal ranges of Mendocino and Sonoma counties, the lower 3.5 miles (5.6 km) of the mainstem forming the common boundary of these counties. The South Fork Gualala River flows northwest along a rift valley formed by the San Andreas Fault, which parallels the coast for about 25 miles (40 km).

The surrounding topography is generally steep ridges and hills, covered with dense stands of redwood and Douglas fir forest. Scattered along both forks of the river are sand and gravel bars, as well as stands of willow and alder. The river valley broadens at its mouth, south of the Highway 1 bridge. In the vicinity of the bridge on both sides of the river are a few scattered freshwater marshes. The lower mile of the river is bordered by a broad grassland-covered bluff to the south and bluffs to the north. During recent surveys (2000 – 2002), coho salmon have been found only in 2002 in some of the Gualala River tributaries, including the Little North Fork Gualala River, Dry Creek, and McGann Gulch.

Hydrologic Subareas	Priority Map Values
Usal HSA	4-4-4-4
Wages HSA	4-5-4-5

Greenwood HSA	1-2-2-5
Elk HSA	2-4-4-5
Alder HSA	0-1-2-5
Brush HSA	1-2-2-5
North Fork HSA	4-4-4-5
Rockpile HSA	0-1-2-4
Buckeye HSA	1-2-2-4
Wheatfield Fork HSA	1-2-2-4
Russian Gulch HSA	1-2-2-4

7.3.2 RUSSIAN RIVER HYDROLOGIC UNIT

The Russian River HU (Figure 7-15) covers an area of approximately 1,485 square miles and includes about 240 named and numerous un-named tributaries. Coho salmon have historically occurred in six of the 11 Russian River HSAs (Guerneville, Austin Creek, Geyserville, Mark West, Warm Springs, and Santa Rosa Creek HSAs).

The Russian River HU has been described extensively within the context of a fisheries restoration plan (CDFG 2002). In keeping with the format of that plan, the mainstem of the Russian River is described here as a separate entity, although this is not done for any of the other watersheds included in this recovery strategy.

Approximately 95% of the river's natural runoff of about 1,600,000 acre-feet occur between November and April. Summer flows are regulated by releases from Lake Mendocino (impounded by Coyote Dam) and Lake Sonoma (impounded by Warm Springs Dam). The Potter Valley Project also contributes up to 300 cfs to the river above Lake Mendocino. Mean daily temperatures can exceed 23 ºC in some sections of the river, causing stress to salmonids and promoting proliferation and persistence of predatory warmwater fish species. Fish migration is adversely affected by natural and man-made physical barriers such as bedrock constrictions and falls, debris jams, dams, road crossings, and culverts.

Urban and industrial uses are concentrated around cities in Mendocino and Sonoma counties. Uses include high-technology industries, petroleum distribution plants, light manufacturing, wrecking and salvage yards, and industries related to construction. Santa Rosa is the chief commercial distribution center for the north coast of California. Other land uses such as timber harvest, agricultural production, livestock grazing, and gravel mining, have been present in the Russian River watershed for decades and continue today. Agriculture is still the dominant land use within the basin, with the recent trend being conversion of historic crop lands, livestock, dairy lands, and forest lands to vineyards.

Of the four salmonid species that historically occurred in the watershed (Chinook salmon, pink salmon, coho salmon, and steelhead trout), pink salmon have been virtually extinct since 1955, while the other three species are currently listed as threatened under the federal ESA. Natural coho salmon production in the Russian River system was augmented through annual releases of about 70,000 yearlings produced at the Warm Springs Hatchery (WSH) between 1980 and 1998. A captive coho salmon broodstock program was initiated by the Department, NOAA Fisheries, and USACE at WSH in 2001. Using conservation hatchery principles, its goal is to restock selected streams within the Russian River basin with juvenile coho salmon derived from local natural spawning populations.

Potential problems for coho salmon recovery in the Russian River basin include barriers to migration, poor gravel quality, inadequate gravel quantity, lack of riparian stability, loss of native plant species, invasion of non-native plants, inappropriate water temperature, poor water quality, and an altered hydrologic regime. The river is listed as impaired for sediment on the 303(d) list of the Clean Water Act.

7.3.2.1 Recommendations for the Russian River HU

RR-HU-04 Assess, prioritize, and develop plans to treat barriers to passage.

RR-HU-06 Assess riparian canopy and impacts of exotic vegetation (especially *Arundo donax*), prioritize, and plan riparian habitat reclamation and enhancement programs.

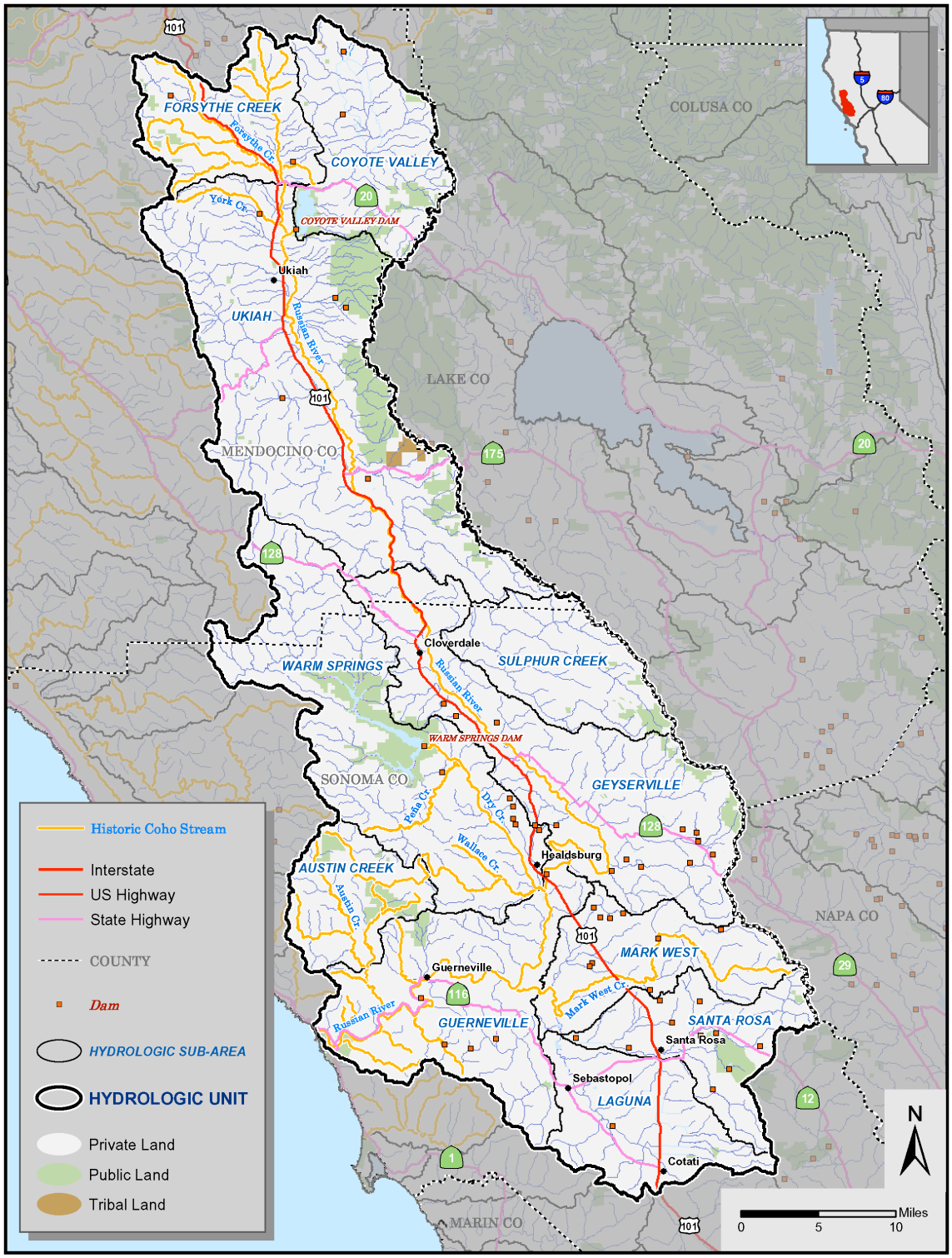
RR-HU-07 Implement the Sotoyome Resource Conservation District's Fish Friendly Farming Program within Sonoma and Mendocino counties.

RR-HU-08 Implement Coho Salmon Captive Broodstock Program:

a. Continue genetic analysis of source stocks for coho salmon broodstock. Recent genetic data produced by the Bodega Marine Laboratory (BML) and the NOAA Fisheries laboratory at Santa Cruz identifies that source populations in the Russian River and Marin County are genetically distinct. Further analysis of other broodstock year classes needs to be completed by NOAA Fisheries to weigh the risks of inbreeding and outbreeding depression in the captive broodstock program. A review of stocking history may help determine how locally adapted stocks can be utilized to enhance variability and reduce risk of extirpation. This review should be completed before mating protocols are finalized and implemented (The Department has completed this review in the Russian River HU, and the review for Bodega-Marin Coastal HU is underway);

b. Stock first priority barren streams. First priority streams are streams the Department has identified with good habitat condition resulting from complete restoration or unimpaired functions include Felta and Mill creeks (tributary to Dry Creek west of Healdsburg), Freezeout, Willow and Sheephouse creeks (near Duncans Mills), and Ward Creek (tributary to Austin Creek). Identify additional streams that may be suitable for stocking as restoration occurs;

FIGURE 7-15: Russian River Hydrologic Unit



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c. Develop and implement a monitoring and evaluation program to adaptively manage the coho salmon broodstock program. Coordinate and implement a monitoring and evaluation program that would meet high and medium priority monitoring objectives as outlined in the coho salmon HGMP;

d. Develop, implement, and evaluate experimental release protocols for the captive broodstock program.

e. Review and revise long-term hatchery program goals based on results of the monitoring and evaluation program implemented in the experimental captive broodstock program; and

f. Develop and implement a long-term monitoring program for coho salmon abundance trends in suitable index streams that have recent (within 8 years) coho salmon presence or that will be supplemented with the captive broodstock program. (The Department has contracted Humboldt State University to develop these protocols in coordination with NOAA Fisheries).

RR-HU-09 Review and develop preferred protocols for Pierce's Disease Control that would maintain a native riparian corridor and develop an outreach program.

RR-HU-11 Sonoma County and Mendocino County should develop grading and erosion control standards supported by a grading ordinance, to minimize sediment impacts to coho salmon habitat.

RR-HU-12 Restore fish passage at County structures on all streams inhabited by coho salmon, as identified in the Russian River Fish Passage Assessment report, (Taylor March 2003). Encourage expansion of fish passage inventories as needed to use a comprehensive watershed approach to fish passage. Integrate fish passage projects at county facilities with fish passage improvements involving other landowners, throughout targeted coho salmon watersheds.

RR-HU-15 Sonoma and Mendocino County planning and public works should promote alternatives to conventional bank stabilization for public and private projects, including bioengineering techniques.

RR-HU-16 Sonoma and Mendocino counties and incorporated areas should review development set-backs for adequacy in protecting critical streams inhabited by coho salmon, and revise as needed. Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers.

RR-HU-17 Sonoma and Mendocino County Public Works, Transportation Departments, Parks and Open Space Districts, should inventory, evaluate and fix problem roads which systematically contribute sediment to streams inhabited by coho salmon.

RR-HU-18 Support efforts and develop county programs to protect and increase instream flows for anadromous fish. Sonoma and Mendocino counties should have policies to minimize impervious surfaces and promote surface water retention. The counties should participate in regional water management planning through the General Plan process and in other venues as appropriate.

7.3.2.2 Russian River Mainstem

The mainstem of the Russian River extends for about 96 miles from the mouth to the headwaters of the river above Lake Mendocino. It is dominated by alluvial stretches in the Lower, Middle, and Upper Reaches, separated by bedrock sections of variable lengths. Factors specific to the mainstem that limit coho salmon production include barriers to upstream migration posed by permanent and seasonal dams, stream crossings and culverts, inadequate gravel quantity, insufficient riparian stability, and inadequate water quality and quantity.

RR-MS-01 Manage summer flows in the mainstem of the Russian River to the benefit of rearing salmonids and the estuary, while ensuring that all existing legal water uses and rights are accounted for.

RR-MS-02 Investigate the opportunity to operate the estuary as a natural system, allowing periods of closure to benefit salmonid rearing, and appropriate timing of opening to benefit salmonid migration/emigration.

RR-MS-04 Evaluate the feasibility of bypassing large dams.

RR-MS-05 Update temperature analyses below Coyote Dam and Warm Springs Dam and review dam management.

RR-MS-06 In upper mainstem, prioritize and plan habitat restoration programs and projects.

7.3.2.3 Guerneville HSA (Priority Map Values: 3-5-5-4)

The Guerneville HSA occupies the southwest end of the Russian River basin in Sonoma County and has an area of 102,301 acres (approximately 160 mi^2). It extends from the mouth of the river at the Pacific Ocean upstream to Healdsburg and east to the outskirts of Sebastopol. Major tributaries include Green Valley Creek, Fife Creek, Hulbert Creek, Dutchbill Creek, and Willow Creek.

The lower reaches of the near-coast streams within the basin contain marsh-like environments, which are subject to daily tidal influence. Most of the subbasin is privately owned, but it also contains Armstrong Woods State Park, consisting of about 805 acres in the Fife Creek watershed and 365 acres in the Willow Creek watershed. No watershed plans have been adopted for these watersheds, although considerable resource assessment work has been completed and community watershed groups have been organized in both.

During recent surveys (2000 – 2002), coho salmon were found only in three Russian River tributaries: Green Valley Creek, Dutchbill Creek, and Mark West Creek. Coho salmon have been found in each of the last ten years, except 2001. They were found in Dutch Bill Creek in 2002 but not in 2001, and in Mark West Creek in 2001 but not in 2002.

RR-GU-02 Assess, prioritize, and treat sources of excess sediment.

RR-GU-03 Supplement first priority barren streams as part of the coho salmon broodstock program. Within the Guerneville HSA, these streams include Willow, Sheephouse, Freezeout, Dutchbill and Green Valley creeks.

RR-GU-07 Assess, prioritize, and develop plans to treat barriers to migration and improve fish passage.

7.3.2.4 Austin Creek HSA (Priority Map Values: 1-2-3-5)

The Austin Creek HSA consists of the Austin Creek watershed and includes the major watersheds of Big Austin, East Austin, and Ward creeks. It drains an area of 39,867 acres (62 mi^2). Numerous perennial and intermittent streams feed both the mainstem of Austin Creek and the larger tributary systems. Many of the headwater areas are geologically unstable, and the basin has the highest average annual rainfall of any area within the Russian River region. Major land uses in the Austin Creek subbasin include timber production, gravel mining and rural development. The watershed is primarily privately owned, except for portions under California State Park system ownership. Parts of the watershed are now protected from development as a part of Armstrong Woods State Park and Austin Creek State Recreation Areas, together covering 5,683 acres. During recent surveys (2000 – 2002), coho salmon have not been found in Austin Creek or any of its tributaries.

RR-AU-02 Assess, prioritize, and treat sources of excess sediment.

RR-AU-03 Supplement first priority barren streams with the coho salmon broodstock program, such as Ward Creek. Identify additional streams that may be suitable for stocking as restoration occurs.

RR-AU-05 Assess, prioritize, and develop plans to treat barriers to migration and improve fish passage.

7.3.2.5 Warm Springs HSA (Priority Map Values: 1-3-3-3)

The Warm Springs HSA runs along the western edge of the Russian River basin in Sonoma County and contains the Dry Creek watershed and Lake Sonoma. This subbasin is named after Warm Springs Dam, constructed in 1982, which impounds Lake Sonoma. The subbasin drains an area of 139,537 acres (218 mi^2). Approximately 130 square miles of the watershed are above the lake and completely inaccessible to anadromous species. Major tributary watersheds within the Dry Creek watershed below the dam include Pena Creek and Mill Creek, as well as numerous perennial and intermittent tributaries. Cherry, Warm Springs, and Gallaway creeks are major tributary watersheds above the dam.

Warm Springs Hatchery, operated by the Department, was built in mitigation for lost habitat and fish runs on Dry Creek above the dam. Ownership within the subbasin is primarily private, although USACE owns Lake Sonoma. The Dry Creek watershed has been the site of intense agricultural development since the turn of the twentieth

century. Conifer forest dominates the upper HSA, but there are zones of grassland and oak-woodland in the lower watersheds and floodplain areas. Primary land uses today are vineyard cultivation, scattered rural development and grazing, and recreation within the boundaries of Lake Sonoma. Some timber is still harvested within the basin, converting the uplands to agricultural use. During recent surveys (2000 – 2002), coho salmon were not found in Dry Creek or any of its tributaries, although coho salmon were detected inconsistently in some tributaries during the 1990s.

Recommendations for the Warm Springs HSA are:

RR-WS-01 Develop plans to improve riparian vegetation in Dry Creek and its tributaries. Develop and implement riparian improvements through land-use planning, use of conservation easements, and implementation of the Sotoyome Resource Conservation District's Fish Friendly Farming Program

RR-WS-03 Supplement first priority barren streams as part of the coho salmon broodstock program, such as Mill and Felta creeks. Identify additional streams that may be suitable for stocking as restoration occurs.

RR-WS-05 Assess, prioritize, and develop plans to treat barriers to migration and improve fish passage.

RR-WS-06 Assess, prioritize, and develop plans to treat sources of excess sediment.

RR-WS-07 Increase habitat structure and complexity in Dry Creek to enhance habitat diversity, and provide depositional areas for spawning gravels for coho salmon (i.e., place large woody debris or large boulder structures).

7.3.2.6 Mark West Creek HSA (Priority Map Values: 2-4-4-4)

The Mark West HSA contains Mark West Creek and its tributaries. Mark West Creek traverses Sonoma County in a general east-west direction, meets the Laguna de Santa Rosa, and flows into the Russian River at Mirabel Park, about eight miles east of Guerneville. The subbasin covers an area of 55,247 acres (86 mi^2), and includes the major tributary watersheds of Windsor Creek, Humbug Creek, and Porter Creek. Mark West Creek and its tributaries drain a basin of approximately 40 square miles.

Most of the stream in the middle section is bordered by cultivated fields and housing developments. Where the Mark West subbasin meets the Russian River, vegetation is dominated by typical redwood forest. Oaks, bays, redwoods, Douglas fir, maples, madrone, and manzanita characterize the vegetation near the headwaters. Riparian vegetation is composed of willow, oak, bay, alder, maples, blackberry, and a few redwoods. During recent surveys (2000 – 2002), coho salmon were found in Mark West Creek only in 2001, although they were detected in 1993 and 1994.

Recommendations for the Mark West Creek HSA are:

RR-MW-01 Reduce habitat fragmentation and implement riparian improvements through land-use planning and use of conservation easements.

RR-MW-02 Develop plans to improve instream habitat conditions.

RR-MW-03 Assess, prioritize, and develop plans to treat barriers to migration and improve fish passage.

RR-MW-04 Assess, prioritize, and develop plans to treat sources of excess sediment.

7.3.2.7 Santa Rosa Creek HSA (Priority Map Values: 1-3-3-3)

The Santa Rosa Creek HSA is located in the southeastern portion of the Russian River watershed, and contains Santa Rosa Creek and its major tributaries, Matanzas Creek and the North and South Forks of Santa Rosa Creek. It covers an area of 49,511 acres (77 mi^2). Santa Rosa Creek is a tributary to Laguna de Santa Rosa, which flows into Mark West Creek.

The upper watershed consists of mixed evergreen forest graduating to oak woodland. The creek is channelized for about seven miles from the Santa Rosa City Hall downstream to Laguna de Santa Rosa. Santa Rosa, located at the intersection of Highway 101 and Highway 12, and is the most urbanized and densely populated city within the Russian River basin. The area has seen a long history of agricultural and urban development. The discharge from the Santa Rosa Wastewater Treatment Facility is released into the Russian River via Santa Rosa Creek and Laguna de Santa Rosa. The Santa Rosa Creek watershed is primarily in private landownership, although some portions are owned by the City of Santa Rosa and the Sonoma County Regional Parks Department. The Santa Rosa Plain contains a large number of confined animal operations, including almost 100 dairies. Conversion of pasture and orchards to vineyards has increased significantly in the past decade. The primary land use today is urban development, although livestock grazing and vineyard development also exist. The upper basin, incorporated into Hood Mountain Regional Park and the McCormick Sanctuary, is now protected from further development. During recent surveys (2000 – 2002), coho salmon have not been found in Santa Rosa Creek, although they have been detected in 1993 and 1994.

Recommendations for the Santa Rosa Creek HSA are:

RR-SR-03 Assess, prioritize, and develop plans to treat sources of excess sediment.

RR-SR-04 Assess, prioritize, and develop plans to treat barriers to passage.

7.3.2.8 Forsythe Creek[3] HSA (Priority Map Values: 1-3-2-3)

The Forsythe Creek HSA, in the northwestern portion of the Russian River watershed in Mendocino County, contains the Forsythe Creek watershed and the West Fork drainage of the Russian River. The Forsythe Creek subbasin drains 53,966 acres (84 square miles). The Forsythe Creek watershed and its tributaries drain a basin of approximately 47.7 mi^2. Major tributaries within Forsythe watershed are Mill, Jack Smith, and Eldridge creeks. Many man-made and several natural lakes occur throughout the basin. The West Fork has its headwaters in a mountain forest but predominantly flows through hills of range and pasture land for sheep and cattle, with scattered oak trees. Major tributaries include Mariposa, Corral, Fisher and Salt Hollow creeks.

The streams flow predominantly through oak-, bay-, and maple-covered rangelands with second-growth redwoods in the upper headwaters of the drainage. Much of the central basin area is cultivated as vineyards or used for livestock grazing. Timber harvest is also a predominant land use with scattered rural homesteads. The majority of the Forsythe Creek subbasin is privately owned, with much of the watershed managed for timber production and livestock for the past century. During recent surveys (2000 – 2002), coho salmon have not been found in any of the creeks or their tributaries in this HSA.

Recommendations for the Forsythe Creek HSA are:

RR-FO-01 Improve migration and summer/overwintering habitat through riparian restoration and erosion control.

RR-FO-02 Assess, prioritize, and develop plans to treat sources of excess sediment.

RR-FO-03 Assess, prioritize, and develop plans to treat barriers to migration and improve fish passage.

7.3.2.9 Geyserville HSA (Priority Map Values: 1-3-3-5)

The Geyserville HSA drains 133,006 acres (208 mi^2), and includes the Alexander Valley reach of the Russian River, the Maacama Creek watershed, and many smaller tributaries. The watershed is dominated by oak grasslands, with the exception of the headwaters, where vegetation consists mostly of gray pine and oaks. Riparian vegetation is generally abundant with alders and willows. Major land uses within the Maacama watershed are vineyard cultivation, cattle grazing, and urban development. The Briggs Creek watershed and its tributaries occupy the northeastern side of the upper subbasin, draining an area of approximately 12.3 square miles. The mixed hardwood forests here are in excellent condition in this pristine sub-watershed. Much

[3] This HSA was not discussed by the CRT.

of the upper Maacama watershed remains in large parcels and is now under protection from further development under Sonoma County Open Space easements. During recent surveys (2000 – 2002), coho salmon have not been found in Maacama and Redwood creeks, although they have been detected in both streams in 1993 and 1994.

Recommendations for the Geyserville HSA are:

RR-GE-02 Assess, prioritize, and develop plans to treat barriers to migration and improve fish passage.

RR-GE-03 Assess, prioritize, and develop plans to treat sources of excess sediment.

7.3.3 BODEGA AND MARIN COASTAL HYDROLOGIC UNITS

The Bodega/Marin Coastal HUs (Figure 7-16) consist of nine HSAs, four of which have documented coho salmon presence – Salmon Creek, Walker Creek, Lagunitas Creek, and Bolinas. Together, they drain an area of about 265 mi^2. In this typical coastal region of California, the climate is highly variable, with basin-wide average rainfall of over 30 inches per year. Approximately 95% of the Salmon Creek and Walker Creek watersheds are in private ownership, whereas about 50% of Lagunitas Creek basin and only 5% of the Redwood Creek watershed in the Bolinas HSA are privately owned. Land uses include protected open space, buffer lands for domestic drinking water, recreation, natural resource protection and management, organic farming, and moderately dense residential development.

Three major reservoirs form barriers to coho salmon distribution in the HUs: Soulajule Reservoir on Arroyo Sausal in the Walker Creek watershed, and the reservoirs formed behind Nicasio Dam on Nicasio Creek and Peters Dam on Lagunitas Creek, both in the Lagunitas Creek watershed. There are no fish hatcheries or fish facilities currently operated in the HUs, although the Department operated a trapping facility on Nicasio Creek during the 1960s to move coho salmon around Nicasio Reservoir.

Watersheds within the HUs have a variety of water quality impairments, including excess sediment, high temperature, low dissolved oxygen, and excessive nutrients. Chronic erosion and sediment sourcing into streams is the primary water quality challenge throughout the HU. Tomales Bay is listed on the Clean Water Act 303(d) list as an impaired water body for high concentrations of bacteria, nutrients, pathogens, metals (mercury) and sediment, and Walker, Lagunitas, and Olema creeks have been listed as impaired for sedimentation, nutrients, and fecal coliform bacteria.

Current knowledge indicates that the primary problems facing coho salmon in the HUs are the permanent loss of access to spawning and rearing habitat above Peters Dam on Lagunitas Creek and above Nicasio Dam on Nicasio Creek, fish passage

barriers on road crossings, high fine sediment loads, low summer stream flow, high summer water temperature, a shortage of cover in the form of large woody debris, and loss of riparian vegetation. The Lagunitas and Bolinas HSAs have recent documented occurrences of coho salmon, while the Salmon and Walker Creek HSAs historically supported the species.

7.3.3.1 Bodega Marin Coastal HU Recommendations

BM-HU-01 Implement BMPs for road projects. Support Sonoma and Marin County Department of Public Works, Caltrans, and other appropriate agencies to implement and maintain environmentally sound upgrades, modifications, and new construction of road projects, including culverts and stream crossings.

BM-HU-02a Continue to implement erosion control projects that were assessed and inventoried in sediment assessment plans throughout watersheds of the HU.

BM-HU-03 To avoid and minimize the adverse effects of water diversion on coho salmon, improve coordination between State Water Resources Control Board (SWRCB), the Department, and other agencies, to promote flows that will provide for a natural hydrograph, and to address protective conditions, such as by-pass flows, season of diversion, and off-stream storage.

BM-HU-04 Encourage local governments to incorporate protection of coho salmon in any flood management activities.

BM-HU-06 On private and public lands, address issues of low flow by increasing riparian protection and restoration, increasing sediment control, and employing BMPs that encourage permeability and infiltration.

BM-HU-07 Continue outreach, education, and enforcement related to household hazardous waste and hazardous materials spills in creeks.

BM-HU-09 Investigate opportunities for restoring historic runs in identified watersheds.

BM-HU-10 Continue to support landowners and the Marin RCD to restore riparian zones and manage livestock to increase stream protection and soil retention. Encourage sustainable land management practices and control of sediment sources in agricultural zones.

BM-HU-12 Implement fish passage improvements as identified in inventories conducted by SPAWN, Taylor and Assoc., Trout Unlimited and the National Park Service. Expand inventories as needed for a comprehensive watershed approach for fish passage.

BM-HU-13 County planning, public works, open space, and fire departments should continue to implement FishNet 4C priority goals for this region, which include:

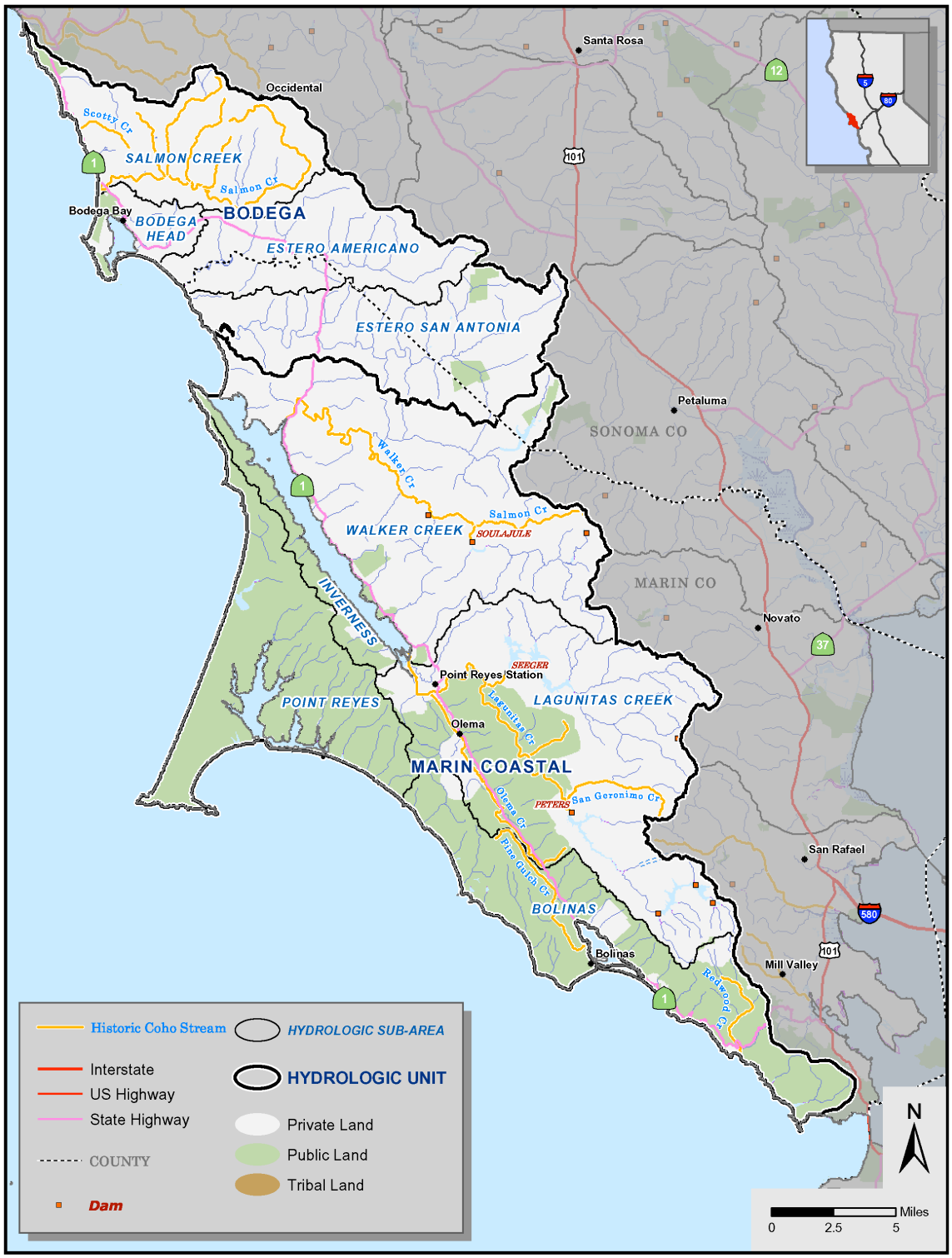
a. Enact and enforce Marin County Streamside Conservation Area Ordinance,

b. Adopt and implement FishNet 4C Road Maintenance Manual: Guidelines for Protecting Aquatic Habitat and Salmon Fisheries for County Operations and Maintenance,

c. Systematically work to restore fish passage at county facilities, and

d. Address issues of sediment from roads through restoration and education.

FIGURE 7-16: Bodega and Marin Coastal Hydrologic Units



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7.3.3.2 Salmon Creek HSA (Priority Map Values: 1-3-3-5)

The Salmon Creek HSA is located in Sonoma County and consists of two watersheds, Salmon Creek and Scotty Creek. Salmon Creek drains 34.5 mi^2 into a tidal estuary located just north of Bodega Harbor along the Sonoma coast. The six major tributaries to Salmon Creek are Finley, Coleman Valley, Tannery, Fay, Nolan and Thurston creeks. Scotty Creek is a small drainage which flows into the Pacific Ocean just north of the Salmon Creek estuary.

Salmon Creek is characterized by a deeply incised channel and highly active bank erosion due to steep topography and livestock grazing. Instream flow data for the Salmon Creek watershed are lacking. Water temperatures in parts of the Salmon Creek watershed during the summer rearing season are mostly acceptable due the basin's close proximity to the coast. During recent surveys (2000 – 2002), no coho salmon were found in any of the creeks of this HSA.

Recommendations for the Salmon Creek HSA are:

BM-SA-01 Coordinate efforts of involved agencies in review of plans for timber harvest and vineyard conversion. Support appropriate entities in the development and implementation of standards and BMPs for agriculture to reduce pathogen, nutrient, and sediment loadings to creeks.

BM-SA-02 Continue to implement erosion control projects that were assessed and inventoried in sediment assessment plans, and monitor effectiveness and maintenance of past and current watershed restoration projects. Augment surveys as necessary.

BM-SA-04 Implement recommendations of watershed plans consistent with the coho calmon recovery strategy. Review existing, approved watershed management or restoration plans within the range of coho salmon and implement actions consistent with priority recommendations of the coho salmon recovery strategy.

BM-SA-05 Encourage the design of vineyard operations to ensure adequate protection of coho salmon habitat attributes, including riparian corridors, instream flow, and water quality.

BM-SA-06 Support a coho salmon limiting factors assessment of the Salmon Creek Estuary.

7.3.3.3 Walker Creek HSA (Priority Map Values: 1-3-2-5)

The Walker Creek HSA consists of the 76-square-mile Walker Creek drainage. It is located primarily in northwestern Marin County, except for a small portion in Sonoma County. Walker Creek is the second largest tributary to Tomales Bay, draining into the northern end of the bay. Together with Lagunitas Creek, it provides 75% of the freshwater into Tomales Bay. Since 1985, releases from Soulajule Reservoir have maintained perennial flow in Walker Creek. Prior to 1985, flow in Walker Creek was intermittent in some reaches, although it is reported that in the early 1900's, Walker Creek was a perennial stream (Haible 1976). The four main

tributaries to Walker Creek are Keys, Chileno, Salmon and Arroyo Sausal creeks. Soulajule Reservoir, which sits high in the watershed on Arroyo Sausal Creek that flows directly into Walker Creek, was constructed in 1968 and is currently managed by Marin Municipal Water District. This reservoir is far enough upstream to allow for salmonid access to a majority of the historic habitat.

The Walker Creek watershed has been listed as impaired for sediment, high nutrients, and high fecal coliform bacteria on the Clean Water Act 303(d) List by the San Francisco Regional Water Quality Control Board. During recent surveys (2000 – 2002), no coho salmon were found in Walker Creek or any of its tributaries.

Recommendations for the Walker Creek HSA are:

BM-WA-01 Continue to fund and support landowners and the Marin RCD to restore riparian zones and manage livestock to increase stream protection and soil retention. Address water quality and nutrient loading issues by encouraging sustainable land management practices, controlling sediment sources, protecting riparian zones and employing BMPs that encourage permeability and infiltration.

BM-WA-02 Continue to support active watershed groups, encouraging a focus on coho salmon restoration where appropriate.

BM-WA-04 Support landowners and the Marin RCD in projects to improve channel conditions and restore natural channel geomorphology, including side channels and dense contiguous riparian vegetation.

BM-WA-05 Implement high priority fishery enhancement projects for the reduction of sediment delivery and the restoration of riparian corridors as listed in the Walker Creek Enhancement Plan (2001).

BM-WA-07 Encourage Marin Municipal Water District to continue to assess the release of water from Soulejule Reservoir to develop the optimum release for coho salmon.

BM-WA-08 Support a coho salmon limiting factors assessment in Keys Estero and Tomales Bay.

7.3.3.4 Lagunitas Creek HSA (Priority Map Values: 4-5-5-5)

The Lagunitas HSA consists of the 103 square-mile Lagunitas Creek basin. This is the largest watershed in Marin County, draining a large portion of the central part of West Marin. Flowing from its headwaters on the north slope of Mt. Tamalpais, it traverses northwesterly 25 miles through four reservoirs to the southern end of Tomales Bay.

Lagunitas Dam (built in 1872), Alpine Dam (built in 1918), Bon Tempe Dam (built in 1948), and Peters Dam (built in 1954), which provide water for domestic use to central and west Marin communities, are all located on Lagunitas Creek. A fifth dam in the basin is Seeger Dam (Nicasio Dam), built in 1961, which forms the Nicasio Reservoir on Nicasio Creek one mile upstream from its confluence with Lagunitas

Creek. The four major tributaries to Lagunitas Creek are San Geronimo, Devil's Gulch, Olema, and Nicasio creeks. San Geronimo Creek flows through San Geronimo Valley and into Lagunitas Creek one-quarter mile downstream of Peters Dam. Devil's Gulch flows through a steep, narrow canyon into Lagunitas in Samuel P. Taylor State Park. Olema Creek flows along Highway 1, joining Lagunitas just downstream of Pt. Reyes Station.

Sub-watersheds that provide spawning habitat include Cheda and McIsaac creeks, which flow directly into Lagunitas Creek, and Woodacre, Larsen, and Arroyo Road creeks, which flow into San Geronimo Creek. During recent surveys (2000 – 2002), coho salmon were found consistently in Lagunitas Creek, as well as in Devil's Gulch and San Geronimo Creek, but only in one or two years in Olema Creek and two other smaller tributaries to Lagunitas Creek.

Recommendations for the Lagunitas Creek HSA are:

BM-LA-01 Use recommendations of existing sediment source surveys to restore habitat of coho salmon. Augment surveys as necessary. Expand inventories as needed for a comprehensive watershed approach for fish passage.

BM-LA-03 Coordinate with appropriate agencies to restore coho salmon passage at barriers identified by Ross Taylor, SPAWN, and others. Complete any needed surveys of migration barriers.

BM-LA-05 Encourage MMWD to commit ongoing resources and support of stewardship in the basin beyond the 10-year mitigation order that expires in 2007 to include: riparian enhancement and protection, sediment source reduction, habitat typing and surveying, coho salmon surveys and counts, water conservation, outreach and education, effectiveness monitoring of projects, planning and assessment of potential restoration projects to benefit coho salmon.

BM-LA-06 Provide incentives for septic inspection, repair, and replacement to reduce aquatic pollution.

BM-LA-08 Develop a monitoring and assessment program for the estuarine reaches of Lagunitas Creek and inter-tidal reaches of Tomales Bay, looking at impacts to coho salmon rearing and emigration.

BM-LA-11 Throughout the Lagunitas drainage, work with private landowners to encourage biotechnical bank stabilization, riparian protections, woody debris retention, and timing of water withdrawals to help protect fisheries.

BM-LA-14 In the San Geronimo sub-watershed, Marin County should determine a policy for reviewing new development projects and impacts to the creek from new well construction. The County should consider adopting recommendations for well developments from the Local Coastal Plan.

BM-LA-15 Encourage the National Park Service to continue practices to benefit coho salmon, including restoration projects, sediment control projects, locating well constructed fences out of riparian zones, repairing headcut gullies as possible, and implementing rotational grazing in locations to minimize erosion and impacts to the creek.

BM-LA-16 Encourage Marin Municipal Water District and the County of Marin to continue to implement and coordinate their Watershed Protection Agreement Program for additional water hook-ups in Nicasio and San Geronimo watersheds.

BM-LA-17 Look for opportunities to restore natural channel form and function in upper watershed to protect summer flows into San Geronimo Creek.

7.3.3.5 Bolinas HSA (Priority Map Values: 4-5-5-5)

The three watersheds in the Bolinas HSA where coho salmon have been identified are Redwood Creek, Pine Gulch Creek and Easkoot Creek.

Redwood Creek basin drains an 8.9 square mile watershed from the west peak of Mt. Tamalpais to its mouth at Muir Beach. Approximately seven miles of Redwood Creek provide accessible habitat for anadromous salmonids and this basin is considered one of the most productive and restorable basins for anadromous salmonid habitat in Marin County. It is largely undeveloped and its resources are protected as state and federal park lands. Major watersheds include Fern, Bootjack, Rattlesnake, Spike Buck, Kent Canyon, and Green Gulch creeks.

Pine Gulch Creek, a 7.6 square mile watershed in coastal Marin County, is the primary freshwater source to Bolinas Lagoon. Seventy percent of the water draining into Pine Gulch Creek flows off of Inverness Ridge, providing perennial flow. Currently, the watershed supports a native self-sustaining population of steelhead trout, and up until the 1970s, a native population of coho salmon. Although the Department and the NPS considered coho salmon extirpated, 538 juveniles were found in August, 2001, and data suggest they originated from more than one redd. Known factors that may limit coho salmon in Pine Gulch Creek are sedimentation/ erosion, lack of pool shelter, and water quantity. Because of the lack of published information, Pine Gulch Creek is not discussed in detail in the watershed summary.

Easkoot Creek is a small perennial tributary with a 1.7 square mile watershed area, flowing into Bolinas Lagoon at Stinson Beach. Easkoot Creek is accessible to anadromous fish in its lower reaches, for a short distance upstream of Highway 1 in the town of Stinson Beach. Lower Easkoot Creek has been highly modified and provides relatively limited potential habitat; however, juvenile coho salmon were observed there in 2002. During recent surveys (2000 – 2002), coho salmon have been found consistently in Redwood Creek, but only in 2002 in Pine Gulch Creek and Easkoot Creek.

Recommendations for the Bolinas HSA are:

BM-BO-01 Implement recommendations of completed sediment source surveys. Supplement surveys as necessary.

BM-BO -02 Continue to support restoration efforts on Bolinas Lagoon and Big Lagoon to benefit coho salmon during all life phases and seasons.

BM-BO-04 Look for opportunities to increase woody debris recruitment and retention.

BM-BO-05 Provide incentives for septic inspection, repair and replacement to improve water quality in both streams and lagoons.

BM-BO-06 Encourage the National Park Service to provide additional space for Stinson Beach Water District for off-stream storage to protect coho salmon in Easkoot Creek.

BM-BO-08 Identify and resolve problems related to trails in these watersheds, including location of trails and access for construction and maintenance of roads and trails.

7.3.3.6 HSAs with No Recommendations

Hydrologic Subarea	Priority Map Values
Bodega Head HSA	0-2-2-0
Bodega Bay HSA	0-1-1-0
Estero Americano HSA	0-1-2-5
Estero San Antonio HSA	0-2-2-5
Tomales Bay HSA	0-1-1-0
Inverness HSA	0-2-2-5
Point Reyes HSA	0-1-2-3
Drakes Estero HSA	0-1-1-0

7.3.4 SAN FRANCISCO BAY HYDROLOGIC UNITS

San Francisco Bay encompasses San Pablo, Suisun, Central, and South bays and covers an area of about 400 square miles (Figure 7-17). It extends for approximately 85 miles from the east end of Chips Island in Suisun Bay westward and southward to the mouth of Coyote Creek near the City of San Jose (Fig. 2.9, 2084 Order). Most of the bay's shoreline has a flat slope which causes the intertidal zone to be relatively large. San Francisco Bay is surrounded by about 130 square miles of tidal flats and marshes. The watershed of San Francisco Bay drains an area of approximately 3,475 square miles (Leidy 1984).

San Francisco Bay Area watersheds are largely urbanized, with some areas in agriculture, grazing and parkland. Most San Francisco Bay watersheds are currently listed as impaired for sediment, nutrients, and pathogens under section 303(d) of the Clean Water Act. Many creeks have intermittent flow during the dry season and can be completely dry for one or more months. Many creeks contain obstructions to salmonid migration in the form of grade-control structures, road crossings, flood control channels, permanent and seasonal dams, and seasonally dry sections. Summer and fall water temperatures in Bay Area creeks tend to be relatively high.

Several creeks and rivers of the San Francisco Bay historically supported coho salmon runs, including Alameda Creek, San Pablo Creek, Walnut Creek, San Anselmo Creek, Corte Madera Creek, and Mill Valley (Arroyo Corte Madera Del Presidio) Creek (Leidy, 1984). No coho salmon have been observed in any waters of the San Francisco Bay Area in the past 21 years.

7.3.4.1 Recommendations for the San Francisco Bay HUs

SF-HU-01 Habitat suitability evaluations in the San Francisco Bay Area should include coho salmon.

SF-HU-02 Where appropriate, apply statewide recommendations to suitable streams in the San Francisco Bay.

7.3.4.2 San Rafael HSA (Priority Map Values: 0-3-2-3)

Historically, coho salmon occurred in the Corte Madera Creek and Arroyo Corte Madera Del Presidio (Mill Valley) drainages (Fry 1936; Hallock and Fry 1967). The last record of coho salmon in this HSA was on September 18, 1981 when Leidy (1984) reported collecting two juveniles from Corte Madera Creek and two from Old Mill Creek (tributary to Arroyo Corte Madera Del Presidio). NOAA Fisheries has identified both Corte Madera Creek and Arroyo Corte Madera Del Presidio as critical habitat for coho salmon. Rich (1995) reported that existing habitat in the Arroyo Corte Madera Del Presidio watershed is not suitable for coho salmon.

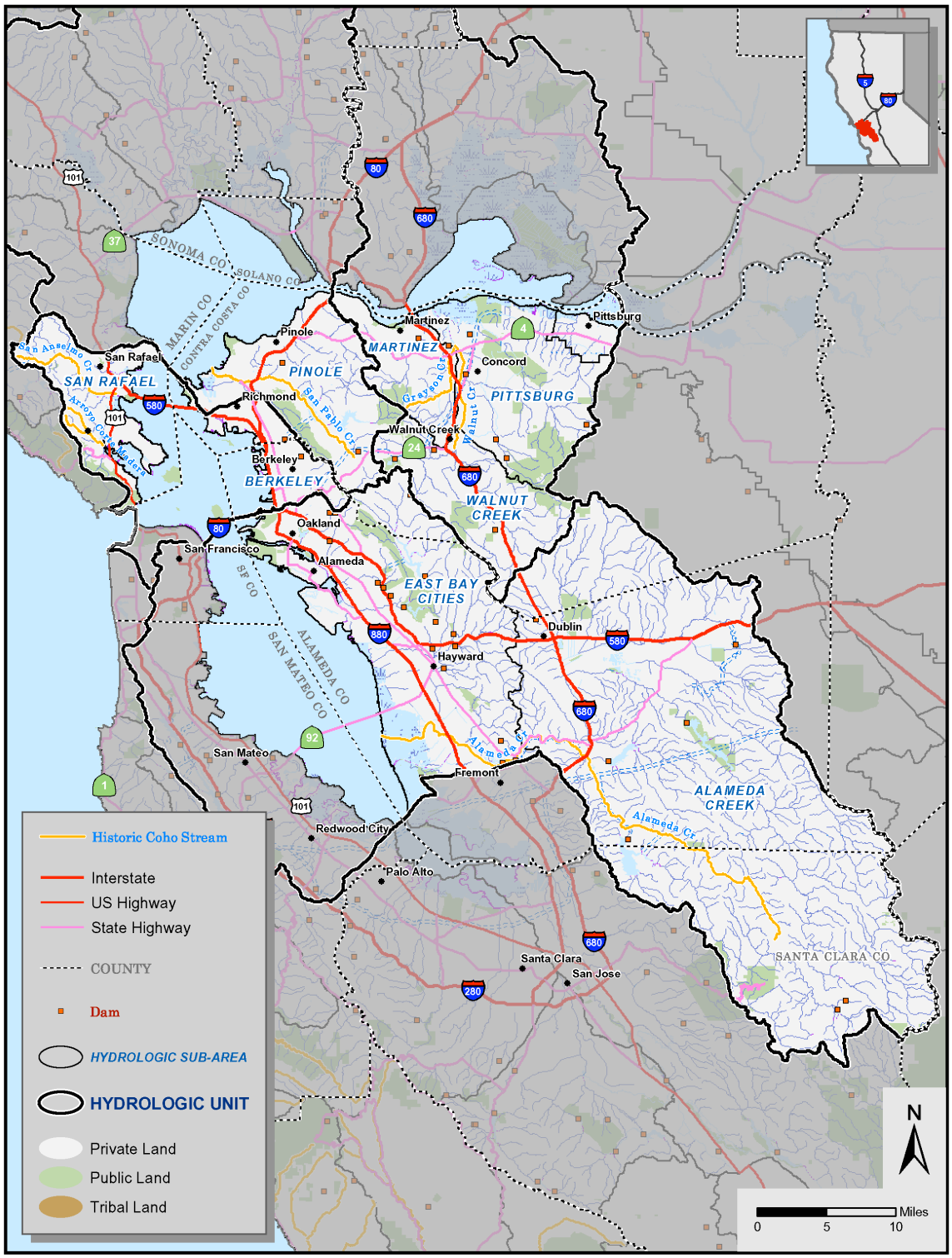
The recommendation for the San Rafael HSA is:

SF-SR-01 Work to restore coho salmon habitat, especially in Arroyo Corte Madera del Presidio and Corte Madera Creek.

7.3.4.3 HSAs with No Recommendations

Hydrologic Subarea	Priority Map Values
Berkeley	0-3-1-1
San Francisco Bayside	0-3-1-N/A
Bay	0-1-1-0
East Bay Cities	0-3-1-1
Alameda	0-3-2-1
San Mateo Bayside	0-3-2-1
Dumbarton	0-1-1-0
Fremont Bayside	0-2-1-1
Coyote Creek	0-3-2-1
Guadalupe River	0-3-2-1
Palo Alto	0-3-2-1
San Pablo Bay	0-1-1-0

FIGURE 7-17: San Francisco Bay Hydrologic Subareas Historically Occupied by Coho Salmon



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Hydrologic Subarea	Priority Map Values
Novato	0-2-2-5
Petaluma	0-3-2-5
Sonoma	0-3-2-4
Napa River	0-3-2-3
Pinole	0-2-2-1
Suisun Bay	0-1-1-0
Benicia	0-2-1-N/A
Suisun Creek	0-2-1-N/A
Suisun Slough	0-3-1-N/A
Grizzly Island	0-1-1-N/A
Grizzly Island - in Delta	0-1-1-N/A
Suisun Slough - in Delta	0-1-1-N/A
Pittsburg	0-3-1-1
Walnut Creek	0-2-1-1
Martinez	0-3-1-1
Pittsburg - in Delta	0-3-1-N/A

7.3.5 SAN MATEO COASTAL HYDROLOGIC UNIT

The San Mateo Coastal HU (Figure 7-18) is near the southern end of the coho salmon range and has been significantly impacted by water diversion, urbanization, road building, riparian development, land use practices, and fire suppression. This HU includes the San Gregorio Creek, Pescadero Creek, and Ano Nuevo (Gazos Creek) HSAs. Four other HSAs, San Francisco Coastal, Half Moon Bay, Pacifica, and Tunitas Creek also fall in the San Mateo HU; however, none of these has any known current or historical information that they are or were coho salmon-bearing streams, and they are not discussed further in this report.

Streams in this HU originate in the Santa Cruz Mountains and flow west or southwest to the Pacific Ocean. They are generally well shaded and summer water temperatures seldom exceed the high 60s°F, although temperatures may be higher in the lagoons and the lower stream reaches. Coho salmon distribution is generally limited to the relatively high-order, low-gradient streams and reaches. The San Gregorio subbasin is entirely within San Mateo County and covers approximately 61 mi^2 . Most of the watersheds for Pescadero and Gazos creeks are within San Mateo County, with a small part of the headwaters located in Santa Cruz County. The Pescadero Creek watershed is approximately 100 mi^2) while the Gazos Creek watershed is approximately 20 mi^2.

San Gregorio, Pescadero, and Gazos creeks all have estuaries whose mouths are frequently blocked by sandbars, forming lagoons. The alteration of the lagoons, in conjunction with increased sediment loads from land use activities, lower stream flows due to water diversions, and other watershed changes have reduced and

degraded rearing habitat for juvenile coho salmon and created a poor freshwater-saltwater transition zone for smolts.

There are few definitive data on historical coho salmon abundance in this HU. Most brood-year lineages appear to be extirpated or very weak in all three watersheds, although surveys found coho salmon in the Ano Nuevo HSA in 2002. Erosion and landslides are significant natural factors shaping habitat in this HU. Reduced flow and water depth during dry months and periods of drought may impede migration of adult and juvenile coho salmon between storms, and limit the distribution of rearing juveniles. Recorded water rights, unregistered riparian diversions, and wells affecting underflow contribute to reduced flow. The use of wells to extract flow from mapped and unmapped groundwater flow is a significant and growing issue in this HU.

Effective maintenance and restoration of stream flow and large woody debris are key challenges to coho salmon recovery in an increasingly urban setting. Comprehensive water storage and distribution is required to provide the habitat necessary for coho salmon recovery.

7.3.5.1 Recommendations for the San Mateo Coastal HU

SM-HU-01 Continue to operate MBSTP Kingfisher Flat Hatchery under the guidance of NOAA Fisheries and the Department as a conservation hatchery to reintroduce missing or supplement very weak brood years.

SM-HU-02 To minimize and reduce the effects of water diversions, take actions to improve State Water Resources Control Board (SWRCB) coordination with other agencies to address season of diversion, off-stream reservoirs, bypass flows protective of coho salmon and other anadromous salmonids and natural hydrograph, and avoidance of adverse impacts caused by water diversion, including funding of assessment and GIS mapping of water diversions and determination and monitoring of Fish and Game Code Section 1600 Program compliance related to water diversions.

SM-HU-04 Implement FishNet 4C priority actions that protect coho salmon.

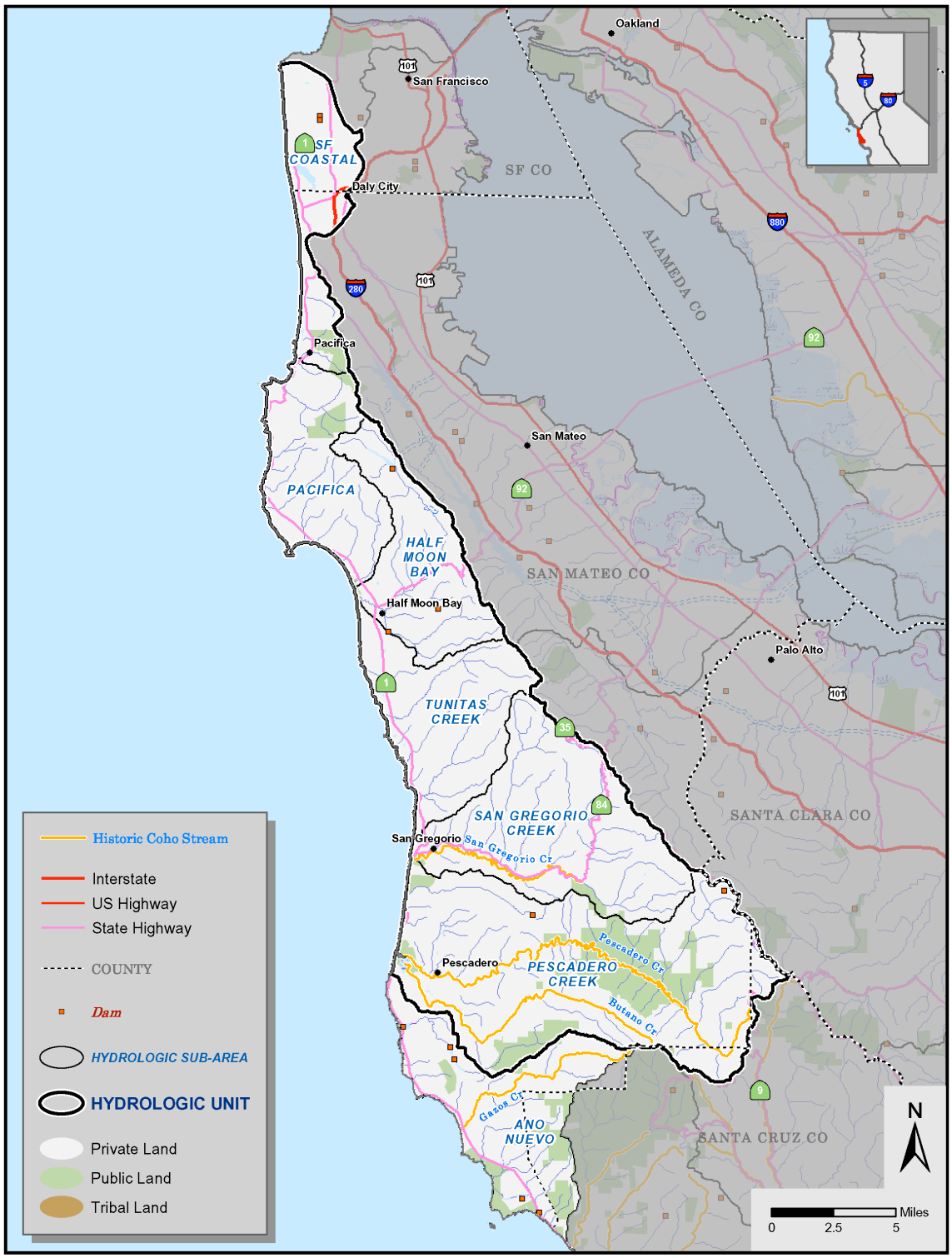
a. Continue to protect riparian zones on streams inhabited by coho salmon within the Coastal Zone according to Local Coastal Plan and Timber Harvest Plan prescriptions. Evaluate the need to apply coastal zone protections to streams inhabited by coho salmon that are not in the coastal zone;

b. Develop, adopt and implement written standards for routine operations and maintenance. Train staff in best management practices;

c. Conduct fish passage assessments and restore fish passage to coho salmon streams;

d. Conduct road assessments and address issues of sedimentation from county public works and parks roads and trails;

FIGURE 7-18: San Mateo Coastal Hydrologic Unit



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e. Promote alternatives to conventional bank stabilization for public and private projects;

f. Establish adequate spoils storage sites throughout the counties so that material from landslides and road maintenance can be stored safely away from anadromous streams. Coordinate these efforts with Caltrans; and

g. Work to increase County enforcement of permit conditions and erosion control plans on development.

SM-HU-05 Support continued economically sustainable management of forest and agricultural lands in the range of coho salmon to reduce the potential for conversion to residential or commercial development.

7.3.5.2 San Gregorio Creek HSA (Priority Map Values: 0-3-4-5) and Pescadero Creek HSA (Priority Map Values 2-4-4-5)

The San Gregorio watershed is located approximately 11 miles south of Half Moon Bay in San Mateo County and covers approximately 61 square miles. The mainstem of San Gregorio Creek is 11.8 miles in length, and has about 33 miles of perennial tributaries. The mainstem of San Gregorio Creek, in combination with its tributaries of La Honda, Alpine, Harrington, El Corte de Madera and Bogess Creeks, contains approximately 33 miles of potentially usable rearing habitat.

Most of the San Gregorio watershed is in private ownership. Land use includes agriculture, developments (residential, minor commercial, and a road infrastructure), cattle grazing, timber harvest, and recreational trails. Because of the large private ownership and development potential, water diversions and low base flows are an important issue in this HSA. In 1993, water rights in the San Gregorio watershed were adjudicated and a minimum stream bypass flow was established. However, the prescribed bypass flows are too low to assure viable coho salmon populations.

Pescadero Creek is located approximately 16 miles south of Half Moon Bay in San Mateo County. The watershed area has an area of approximately 100 square miles . The mainstem of Pescadero Creek is approximately 26 miles (42 km) in length, with an additional 44 miles of perennial tributaries. Approximately 21 miles of mainstem Pescadero Creek and Peters, Slate, Oil and Butano creeks are potential coho salmon rearing habitat. Approximately 30% of the watershed is in public ownership (DPR and the County of San Mateo) and 70% is in private ownership. Land use includes agriculture, timber harvest, grazing, development (residential, commercial, road infrastructure) and recreation.

Recommendations for the San Gregorio Creek and Pescadero Creek HSAs are:

SM-SG-01 Minimize take attributable to diversion of stream flow. Potential take results from three primary impacts to habitat: 1) reduced rearing habitat for juveniles, 2) reduced flows necessary for smolt emigration, and 3) reduced flows necessary for adult immigration. This recommendation would develop and support

alternatives to diversion of stream flow, where the alternatives may include operation of off-stream reservoirs, development of infrastructure necessary for conjunctive use of stream flow, and use of desalinated ocean water.

SM-SG-02 Conduct a watershed assessment in San Gregorio that addresses impacts to coho salmon.

SM-SG-04 Implement BMPs designed to reduce erosion of soil and consequential sedimentation of instream habitat attributable to roads (for example, practices described in the California Salmonid Stream Habitat Restoration Manual).

SM-SG-05 Implement BMPs designed to reduce bank erosion, water temperature, and removal of LWD by improving the form and function of the riparian forest. These BMPs include livestock exclusion fencing, reclamation and reconstruction of floodplain, and active revegetation.

SM-SG-07 Request that the State Water Resources Control Board (SWRCB) declare critical tributaries to San Gregorio and Pescadero creeks fully appropriated during summer and fall months.

7.3.5.3 Año Nuevo (Gazos Creek) HSA (Priority Map Values: 4-5-5-5)

Gazos Creek is located approximately 26 miles south of Half Moon Bay in the southern part of San Mateo County. The watershed is approximately 20 square miles . There is just one year of stream flow data for Gazos Creek and the data have not been completely summarized. The mainstem of Gazos Creek is approximately 6.7 miles in length and has an additional 9.2 miles of perennial tributaries, the most significant of which are Old Womans Creek and two un-named headwater tributaries.

Approximately 6 miles of Gazos Creek and 0.5 miles of Old Womans Creek are potential coho salmon rearing habitat. DPR owns the headwater section of Gazos Creek and a small in-holding of Gazos Creek at the confluence of Old Womans Creek. The remainder of the watershed is privately owned or owned by land-trusts. Land uses include agriculture, timber harvest, developments (residential and a road infrastructure), and recreation. During recent surveys (2000 – 2002), coho salmon were found inconsistently in Gazos Creeks. Gazos Creek had inconsistent presence of coho salmon during the 1990s.

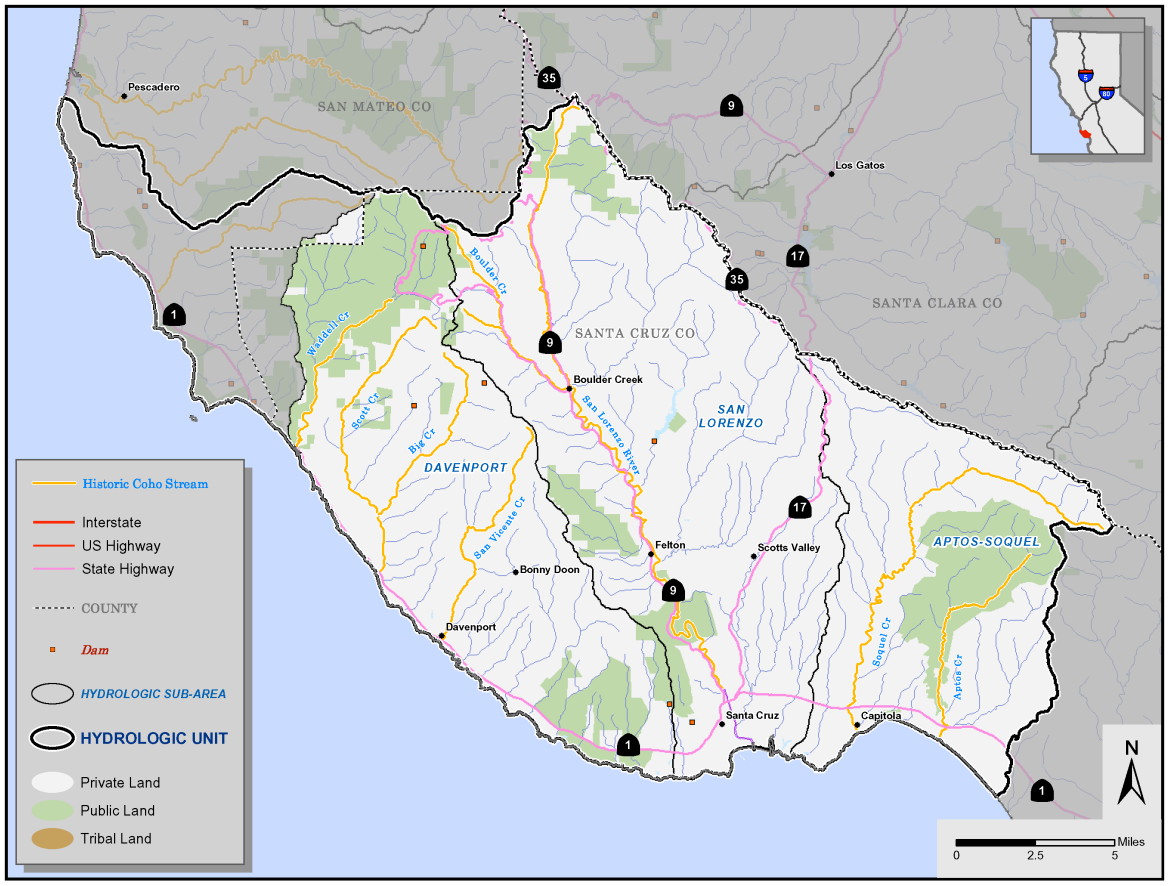
The recommendation for the Año Nuevo HSA is:

SM-AN-01 Implement the projects recommended as high priority for coho salmon in the Gazos Creek watershed restoration plan.

7.3.6 BIG BASIN HYDROLOGIC UNIT

The Big Basin Hydrologic HU (Figure 7-19) is the southern end of the coho salmon range and has been significantly impacted by water diversion, urbanization, road building, riparian encroachment, timber harvest, fire suppression, and other land use practices. This HU includes the following watersheds where coho salmon are or have

FIGURE 7-19: Big Basin Hydrologic Unit



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been historically present: Waddell Creek (20 square miles; 51.8 km^2), Scott Creek (27 mi^2), San Vicente Creek (11 mi^2), San Lorenzo River (138 mi^2), Soquel Creek (23 mi^2), and Aptos Creek (25 mi^2). All are located entirely within Santa Cruz County. Streams in this HU originate in the Santa Cruz Mountains and flow west or southwest to the Pacific Ocean. They are generally well shaded and summer water temperatures seldom exceed the high 60s (ºF); however, some streams or stream sections are too warm for coho salmon rearing.

Because rain and run-off is extremely rare in this HU during summer and fall months, and watershed areas are relatively small, stream flows during summer and fall are usually a critical issue for the survival of coho salmon. Most channel-forming flows and flows necessary for migration of adult coho salmon occur from December to April. These flows breach the sandbars that are common at the mouth of most local streams. Reduced flow and depth due to water diversions may impede migration of adult and juvenile coho salmon between storms, and the range of rearing juveniles is severely limited by water depth during dry months and drought. Reduction of surface flow by pumping of underflow is particularly problematic, because the structures and their effects are relatively difficult to identify and because de-watering is often related to interactions (e.g., cumulative effects) between many structures. There are recorded water rights within the Big Basin HU, in addition to unregistered riparian diversions and wells affecting underflow. The use of wells to extract flow from mapped and un-mapped subterranean streams is a significant and growing issue in this HU.

The Kingfisher Flat Fish Hatchery, located on Big Creek (tributary to Scott Creek), is operated by the Monterey Bay Salmon and Trout Project (MBSTP), a cooperative salmonid rearing project under permit from the Department. Coho salmon production at the Kingfisher Flat Fish Hatchery, utilizing Scott Creek and San Lorenzo River fish, began in the winter of 1986/87. Hatchery operations have been sporadic since then, dependent on the availability of returning broodstock. The hatchery now operates under the principles of a conservation hatchery.

There are few definitive data on historical coho salmon abundance in this HU. Coho salmon distribution is generally limited to the relatively high-order, low-gradient streams and stream sections. Most brood year lineages appear to be extirpated or weak in most watersheds, although Waddell and Scott creeks appear to have one or two relatively strong brood year lineages, respectively. Significant problems for coho salmon in the Big Basin HU include low stream flow, high sediment loads, and lack of large woody debris.

7.3.6.1 Recommendations for the Big Basin HU

BB-HU-01 Continue to operate MBSTP Kingfisher Flat Hatchery under the guidance of NOAA Fisheries and the Department as a conservation hatchery to reintroduce missing, or supplement very weak, brood years. Support the funding to develop and implement a management plan. Operate the facility to accommodate recovery.

BB-HU-02 Provide education and training on coho salmon-friendly water diversion practices to facilitate compliance with pertinent regulation (e.g., Fish and Game Code 1600 et. seq., CFPR 916.9, California Water Code, the Department – NOAA Fisheries guidelines).

BB-HU-04 Develop, facilitate, and support by-pass stream-flow requirements on all streams inhabitated by coho salmon. Evaluate existing structures and apply to all future structures.

BB-HU-05 Implement the highest priority restoration projects in the watershed plans that address coho salmon habitat. Adjust on-going efforts based on results.

BB-HU-06 Complete a broad conjunctive-use feasibility study to focus on creative ways to better manage existing surface and groundwater resources in Santa Cruz County, including all cities and water districts, to better utilize groundwater storage and increase baseflow at critical times. This would involve water sources under the control of Scotts Valley Water District, City of Santa Cruz, Soquel Water District, and San Lorenzo Water District.

BB-HU-07 Develop a lagoon management plan that addresses the needs of coho salmon.

7.3.6.2 Davenport HSA (Priority Map Values: 4-5-5-5)

This HSA is comprised of the watersheds of Waddell, Scott, and San Vicente creeks. Together, they cover an area of about 150 mi^2 (. Waddell and Scott creeks are located a few miles north of the town of Davenport in the northern part of Santa Cruz County and San Vicente Creek flows through Davenport. The mainstem of Waddell Creek is approximately 4.8 miles in length and has an several perennial tributaries, the most significant of which are East and West Branches of Waddell Creek and Henry Creek. All 4.8 miles of the mainstem and 6 miles of the tributaries are potentially usable rearing habitat. Approximately 90% of the watershed is owned by DPR (Big Basin Redwoods State Park) with the remainder is in private holdings. Land uses include recreation, minor residential development and road infrastructure, timber harvest, and agriculture.

The mainstem of Scott Creek is 11 miles in length with an additional 29 miles of perennial tributaries, the most significant of which are Little, Big and Mill Creeks and Bettencourt Gulch. Approximately 8 miles of the mainstem and 5.6 miles of the tributaries are considered potentially suitable rearing habitat. DPR has small in-holdings in the headwaters; however, the majority of Scott Creek watershed is privately owned. Land use in the watershed includes timber harvest, agriculture, residential development and a road infrastructure, equestrian trails and cattle grazing.

Water use is variable and includes storage reservoirs in the headwaters of Big Creek and Mill Creek, wells and surface diversions for domestic uses throughout the watershed, and wells and surface diversions for agricultural purposes in the lowermost portion of the watershed.

The mainstem of San Vicente Creek is approximately 9.3 miles () in length and has an additional 11.3 miles in perennial tributaries, the most significant of which is Mill Creek. However, only 2.5 miles (4 km) of the mainstem and less than 0.25 mile of the tributaries are estimated to be potentially usable coho salmon rearing habitat. At stream mile 3.4, the creek discharges from a mining tunnel, which prevents anadromous salmonids from ascending into the upper portion of the watershed. Water diversion dams located at stream miles 0.5 and 0.75 on Mill Creek prohibit fish from utilizing the upper four miles of this tributary. San Vicente Creek does not have a lagoon; instead, the creek flows through a bedrock tunnel before discharging directly onto a beach and into the Pacific Ocean.

There are few definitive data on historical coho salmon abundance in this HSA. Most estimates of historical abundance are educated guesses by fishery biologists and managers based on limited sampling, surveys, and personal observations. However, it is clear that coho salmon have been extirpated from many tributaries and all brood year lineages have too few individuals to be self-sustaining. During recent surveys (2000 – 2002), coho salmon were found consistently in Scott Creek and some of its tributaries, but less consistently in Waddell Creek.

Recommendations for the Davenport HSA are:

BB-DA-01 Work with the SWRCB to develop and enforce stream flow bypass requirements for diversions from the alluvial reaches ofWaddell Creek, mainstem Scott Creek, Big Creek, Mill Creek, and San Vicente Creek.

BB-DA-02 Petition the SWRCB to declare Scott Creek and San Vicente Creek fully appropriated during summer and fall months.

BB-DA-04 Reduce erosion from roads and resulting sedimentation of instream habitat. Implement established BMPs that account for public safety standards, including, but not limited to, assessment procedures and a suite of road reconstruction prescriptions. This recommendation applies especially to Scott Creek.

BB-DA-05 Encourage State Parks to develop a logjam management plan for Waddell Creek. Log jams should be closely examined for fish passage and conservatively modified if absolutely necessary for coho salmon passage.

7.3.6.3 San Lorenzo River HSA (Priority Map Values: 1-3-3-3)

The San Lorenzo River originates in the Santa Cruz Mountains, and flows in a southerly direction before entering the Pacific Ocean in the City of Santa Cruz. The watershed encompasses an area of 138 square miles . The San Lorenzo River is

approximately 26.3 miles in length and has several additional miles of perennial tributaries, the most significant of which are Boulder, Newell, Zayante, Fall, Kings, Bean, Carbonera, and Branciforte creeks. Approximately 6 miles of mainstem and 20.8 miles of tributary streams are considered potential coho salmon rearing habitat.

The majority of the watershed is privately owned. Land use in the watershed includes residential and commercial development, an extensive road infrastructure, timber harvest, agriculture, cattle grazing, recreation, equestrian facilities, and quarry operations. The San Lorenzo River watershed provides water to residents of San Lorenzo Valley and Santa Cruz, thus stream flows are a critical issue in this watershed. During recent surveys (2000 – 2002), no coho salmon were found in the San Lorenzo River or any of its tributaries.

Recommendations for the San Lorenzo River HSA are:

BB-SL-01 Reduce erosion of soil and resulting sedimentation of in-stream habitat attributable to roads. Implement adopted BMPs, accounting for public safety standards, including, but not limited to, assessment procedures and a suite of road reconstruction prescriptions. This recommendation applies especially to San Lorenzo River.

BB-SL-02 Develop and enforce stream flow bypass requirements for diversions from the alluvial reaches of San Lorenzo River and its tributaries Zayante Creek, Fall Creek, Bear Creek, Boulder Creek, and Branciforte Creek.

BB-SL-03 Evaluate the Felton Diversion Dam for impacts to coho salmon.

BB-SL-04 Improve adult fish passage at locations named in the San Lorenzo River Enhancement Plan, the Santa Cruz Road Crossing and Salmonid Passage Assessment (Taylor 2003) and other locations identified by the Department as being problematic. Implement the portions of these plans that are consistent with the recommendations of the CRT and the coho salmon recovery strategy.

7.3.6.4 Aptos-Soquel HSA (Priority Map Values: 1-3-3-3)

This HSA is comprised of the watersheds of Soquel and Aptos creeks. Together, they cover an area of about 48 square miles . Soquel Creek is located approximately 2.5 miles south of the City of Santa Cruz in Santa Cruz County. Its mainstem is approximately 19 miles in length and has an additional 28 miles of perennial tributaries, the most significant of which are the West Branch Soquel Creek, and Hinckley, Hester, Bates, and Moores creeks. Approximately 9 miles of mainstem and tributary are considered potentially usable coho salmon rearing habitat.

The Soquel Demonstration State Forest is approximately 2,681 acres, essentially all other property in the watershed is privately owned. Land uses include residential and commercial development, an extensive road infrastructure, timber harvest, agriculture, recreation, quarry operations, cattle grazing, and equestrian activities. The City of Capitola actively manages the lagoon by building the sandbar and using a

concrete flume. Because of extensive private ownership and water diversions, the resulting low summer and fall streamflows are a significant issue in the Soquel Creek watershed. In the 1970s, water rights in the Soquel watershed were adjudicated by court decree. The adjudication established relative priorities among diverters in the watershed, but did not specifically consider instream flow needs for fish protection and did not call for the appointment of a watermaster.

Aptos Creek is located approximately 8.5 miles south of the city of Santa Cruz in Santa Cruz County and enters the Pacific Ocean at Seacliff State Beach in the town of Aptos. Its mainstem is approximately 11.5 miles in length, but a 16-foot-high waterfall located at approximately stream mile 9.4 precludes anadromous salmonids from utilizing the headwaters. There are an additional 8 miles of perennial tributaries, the most significant of which are Bridge and Valencia creeks.

About 8.5 miles of Aptos Creek mainstem and approximately five miles of tributaries are considered potential coho salmon rearing habitat. To facilitate beach access, DPR manipulates the mouth of Aptos Creek each summer so that it discharges directly to the ocean. Most of Aptos Creek is owned by DPR (Nisene Marks State Park) or is privately owned; however, a small portion is owned by Santa Cruz County. Bridge Creek lies entirely within the State Park and Valencia Creek is entirely in private ownership. Land uses include residential and commercial development, a road infrastructure, recreation, agriculture, equestrian stables, and timber harvest. During recent surveys (2000 – 2002), no coho salmon were found in Aptos or Soquel creeks.

Recommendations for the Aptos-Soquel HSA are:

BB-AP-01 Implement elements of the Soquel Creek Watershed Restoration Plan consistent with the recommendations of recovery strategy. Specifically focus on projects recommended as high-priority in this coho salmon-centric plan. These projects include preservation of base flow, restoration of floodplains, improvements to fish passage, BMPs to reduce sedimentation of instream habitat.

BB-AP-02 Explore and promote opportunities to assure diversion of streamflow (directly or indirectly) is consistent with perpetuation of Soquel Creek coho salmon. Among others, these opportunities include amendments to the adjudication, water conservation, shallow recharge opportunities, shallow-well gauging, deep-well gauging, stream-gauging, and self-monitoring of diversions.